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Telephony

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Telephony.

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CURRENT OPINIONS AND COMMENTS

Although we seldom stop to realize it, so young is the telephone that its 50th birthday will not be celebrated until 1926. Great has been its development, however, and just how great is emphasized by the fact that a few days ago New York talked across a distance of 3,400 miles to an English audience for nearly two hours, and transmitted long messages—speeches, really—that were heard distinctly and clearly understood.

This is some progress from that eventful day in March, 1876, when Professor Bell spoke over a wire and was heard by his colleague in an adjoining room of the same building. That first telephone message traveled about 100 feet. When President Thayer and General Carty talked to England the other evening, their voices were flung 3,400 miles over land and sea, only 70 miles of which was by wire.

Wonderful as is this achievement, the public have grown so accustomed to miracles being performed by science that the feat has attracted comparatively little attention from people generally, but to the thoughtful it is full of significance.

* * * *

Probably the greatest boon that the human race could receive would be immunity from war. If the world were assured of universal and perpetual peace, the race would be free to go ahead with the work of civilization without fear of interruption by war which destroys that work. With war abolished the peoples of the earth could go to work and utilize in constructive directions all the energy that is now worse than wasted.

Better communication between the inhabitants of this planet will do more to put war on the shelf than any other one human agency. The telephone, the telegraph, the post, the press—anything that helps to make people better acquainted with each other—tends towards peace and friendship and general good will.

* * * *

When James L. Cowles, of Connecticut, died he was given credit for establishing the parcel post system, and those who knew him best highly praised his benevolent motives. One obituary sketch said: "All his activities were guided by the dream of a world eventually brought to complete peace and friendship *through unlimited communication among its inhabitants.*"

That serves to emphasize the belief that, as communication facilities multiply, a better understanding will develop and grow among people, and reduce the risk of jealousy, suspicion and ill feeling that lead to actual warfare or class differences.

As a means of strengthening friendly relationships among people, the parcel post, of course, does not compare with the telephone which establishes a much more intimate association.

* * * *

President Thayer touched on this point, while he was talking to England, when he expressed the opinion that there would have been no war with Great Britain in 1776, had there been as good communication between the two countries as there is today. He meant, doubtless, that quicker, more complete communications between them would surely have created a better understanding that would have prevented the clash which became the American Revolution.

Of course, all true Americans are glad that war was fought, for it gave birth to our country, but at this day and age of the world the feeling is universal that peace is desired most of all, and that free communication among all the nations will do much to bring it to pass.

* * * *

The New York experiment brought out the fact that the wireless telephone transmits messages far more efficiently at night than during the day, as the absence of sunlight adds infinitely to the strength of the signals.

It was also demonstrated that the wireless waves travel over the water with much greater facility than over the land. For that reason, it is stated that the long distance wireless telephone is not expected to play an important part in transcontinental service, at least not according to present engineering theory.

* * * *

Press comments on the 3,400-mile telephone communications call attention to the lack of privacy in the wireless service, and contend that for that reason it will not interfere with the wire telephone business. On that point the New York Times says editorially:

"In that peculiarity, as well as in the greater difficulties for the radio telephone of traversing land areas, is due, presumably, the confident predictions of the experts that the newer methods will supplement, but not replace, or even seriously interfere with the telephoning that is done with the help of wires.

"Certainly the older telephony has not put an end to the still older telegraphy, and the chances are that between wired and wireless telephony there will be co-operation rather than competition."

The story of the experiment again shows how far in advance of the whole world the United States has forged ahead in the development of the telephone art. Messages were spoken from this side of the Atlantic to England, but the acknowledgments came back by the telegraph cable, as they had no sending apparatus. This equipment will be shipped over there and set up in a short time so that the spoken messages can be exchanged.

Attention is called to this situation in no critical spirit, for British telephone leaders have always been frank to admit that conditions in America have been much more favorable to the improvement and refinement of the art.

* * * *

Professional humorists sometimes have strange ideas as to what is funny. They have been utilizing, more or less successfully, the incident of the angry telephone subscriber who tore his telephone off the wall, carried it to town and slammed it through the glass door of the exchange building as an indication that he didn't approve of the service.

The newspaper paragraphers have used considerable space joking about the subject. Of course, they humorously commend the irate subscriber, for the easiest way to get a "josh" out of the episode was to poke fun at telephone service and pretend the telephone is a nuisance.

If some reader of the newspaper, resenting an item in its columns, had heaved a copy of the paper (wrapped around a brick) through the editorial window, it wouldn't have seemed funny at all. The police magistrate who heard the telephone case didn't think so either, for he fined the angry subscriber $25 and costs.

Press humorists who make the telephone the subject of ridicule show they are hard up for material for their columns, as the public is realizing more every day how indispensable telephone service is. Of course, the humorists are "only fooling," but it is silly business for all that. They will realize it some day.

Future of Long Distance in Europe

Recent Developments in Telephony Which Have Caused Alterations in Practice in Long Distance Communication and The Future—Part of President's Inaugural Address Before the British Institution of Electrical Engineers

By Frank Gill, O. S. B.

European Chief Engineer, International Western Electric Co.

If we consider primitive man, his first and immediate need is for food, then shelter and defense, then tools and clothes; but directly he has arrived at the state in which his own and his immediate neighbors' wants have been supplied, so far as their own exertions can supply them, the need for communication arises, and that even before the need for transportation.

There is, however, no need to insist on any priority as between these two arts; they are so intimately connected that we may, without any violence to meaning, define communication as transportation of intelligence; without communication man cannot know where to obtain such of his requirements as he himself is unable to satisfy; without it there is no use in his producing more than he requires for himself, since in its absence, he cannot know whence arises a demand for his spare produce.

While all this is true of primitive man, it has applied much more intensely since machinery came to the aid of production in the complicated system of trade which now serves the world. That which 50 years ago was regarded as a luxury to be enjoyed only by the few, is now a necessity to the many. Today no nation stands alone or is sufficient for itself; more and more the interdependence of nations is being recognized; and more and more is it realized that no nation can be prosperous or afflicted without a result being felt by other nations.

It is easy to illustrate this community of nations by taking the clothes we wear, the food we eat, but all this is well known to you; it is sufficient to say that to bring together the products of all the world to your doors is the work of communication and transportation, and that the efficiency of both is vital. Other things being equal, the nation best equipped with the means of production, communication and transportation will enjoy a great advantage in the race for commercial supremacy, and perhaps also in the search after national well-being.

It follows, therefore, that a great responsibility is laid on those to whom is entrusted the means of communication, or who control those means, whether government department, public company, or other agency, and particularly so because it is at last generally recognized that competition is not an aid to efficiency in this business. In return, therefore, for the grant of facilities to carry on its work, each grantee authority must ultimately recognize its duty to the public, and if it realizes this, dare not adopt either the selfish attitude of attempting to make as much profit as possible, nor the passive attitude of merely supplying the service demanded by the public.

To discharge its duty it must diligently and actively search out new means and facilities and also set about educating the public in regard to their need for communication. The authority is the custodian of the knowledge; it must teach the public what the public did not at first realize—that efficient communication is the life blood of commerce and of national and international understanding and amity—and without effective communication there would appear to be little chance of success for such projects as the League of Nations.

It is by this campaign of education that the well developed industries of the world have been stimulated, not by merely diligently serving the public demands. The railways have themselves created demands for traffic; the press has done the same; so has every great and successful industry, and so must the telephone industry if it is not to fail in the performance of its duty.

The fact that so much of the means of electrical communication in Europe is under government ownership, and under the present prevailing custom removed from it the stimulus of profit earning, makes it quite possible that governments may instruct their telephone and telegraph departments that they do their duty when they diligently supply the public demands for service, and perhaps such a course is the more probable when the many other

calls for expenditure experienced by governments today are considered.

But here a deliberate choice must be made. Is communication and even better communication a necessity or not? If it is, then the passive attitude of merely satisfying public demands must be abandoned and an aggressive attitude take its place.

It is not by a passive attitude that the great development in telephones has been built up in the United States, Canada, Denmark, Sweden and Norway, but rather by a resolute, purposeful and well directed campaign of education of the public and of existing users. In the United States particularly, there has for years been an educational campaign of a very high order, coupled with the construction of plant in advance, without which it is, of course, worse than useless to create demand.

All this seems self-evident and trite, but two questions will test very quickly whether in fact this matter is quite so

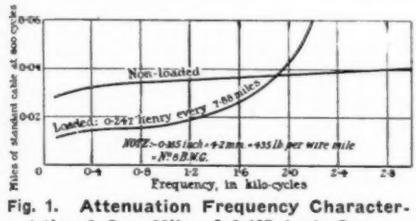


Fig. 1. Attenuation Frequency Characteristic of One Mile of 0.165 Inch Open Wire Line. Dry Weather Conditions Assumed.

self-evident and obvious as it appears. These questions are:

(1) Has telephony, during the 46 years it has been available, been of as much use to Europe as it might have been?

(2) Have the organizations, government and otherwise, been permitted to do what they have wished to do?

The answer to both questions is most decidedly—No.

It will be noticed that it was assumed, for the moment, that a government department should not earn any more money than necessary to be self-supporting, but it seems also wrong to reason that a government department should not earn something more than just enough merely to pay its way; it is undoubtedly healthy for the *esprit de corps* of any organization, that its personnel should know that their organization is an efficient one, in which they can take a justifiable pride—and one of the ways of testing the efficiency of public concerns is to associate service with returns.

With a staff comprising many persons, it is unhealthy that the idea should prevail that profit earning is of no account. There is, however, more than the question of the effect on the staff, important though that be. Without a surplus of income over expenses, there is no margin for unforeseen contingencies which must constantly arise in such a flexible business; service trials and research are likely to be adversely acted upon and capital will be raised with greater difficulty.

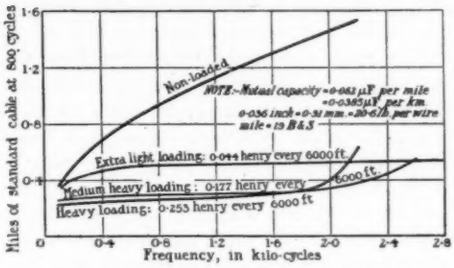

Non-loaded
Extra light loading: 0·044 henry every 6000 ft.
Medium heavy loading: 0·127 henry every 6000 ft.
Heavy loading: 0·255 henry every 6000 ft
Frequency, in kilo-cycles

Fig. 2. Attenuation Frequency Characteristic of One Mile of 0.036 Inch Cable Circuit.

Further, there seems no reason why a government should not include in the rentals a sum plainly intended to be a contribution towards revenue; it is difficult to see any reason why it is permissible, for the purpose of raising revenue, to tax, say, food, but not telephones, or why it is proper to make a considerable surplus on postage, but not on telephones.

It would seem that the correct course is for a government, if it operates the telephones of a nation, to raise from them something towards the national revenue and pay such a return on the capital invested in the business as to make certain its ability to raise whatever money may be required to extend the business.

Let us now pass on to consider some of the alterations in practice caused by recent developments in telephony as they affect long distance or through communication.

Loading.

By the term "loading" is meant the deliberate addition of inductance to the circuit for the purpose of increasing the distance over which satisfactory speech is feasible.

Such inductance may be in the form of evenly distributed inductance, effected by wrapping the copper conductor with magnetic material, such as fine iron wire, or, and more commonly, it may be in the form of lumped inductions obtained by inserting in series in the circuit at intervals, coils having the required inductance and a minimum resistance. It was in 1887 that Oliver Heaviside pointed out that the addition of inductance by either of these methods (inductance being then thought

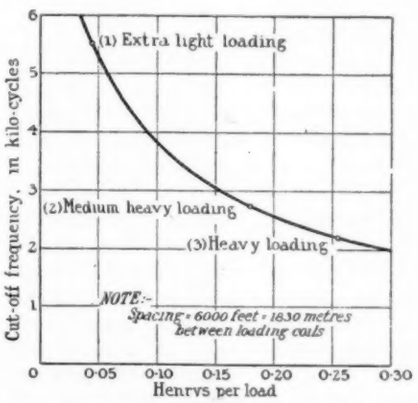

(1) Extra light loading
(2) Medium heavy loading
(3) Heavy loading
NOTE:-
Spacing = 6000 feet = 1830 metres between loading coils
Cut-off frequency, in kilo-cycles
Henrys per load

Fig. 3. Effect of Loading Upon Cut-Off Frequency.

harmful), would be beneficial to the transmission of speech.

Fig. 1 shows the loss for one mile of circuit at various frequencies in respect of open-wire circuits weighing 435 pounds per mile (4.2 mm. diam.) both for non-loaded and for circuits loaded with 0.247 henries every 8 miles (12.9 kilometres); the computations are made for the steady state—that is, when the temporary effect of transients has passed off.

From these curves we may see that the effect of loading has been threefold:

(1). The attenuation has decreased, taking 800 cycles for example, from 0.035 to 0.016 mile of standard cable, a reduction in loss—that is an improvement in volume of speech, of 54 per cent.

(2). Between about 400 and 2,000 cycles the curve of loss has a greater slope for the loaded line, indicating that the various frequencies necessary to transmit satisfactory speech are less uniformly trans-

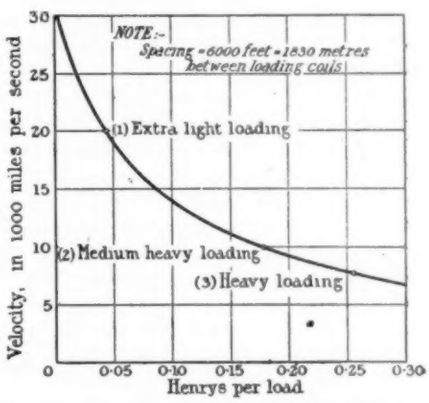

NOTE:-
Spacing = 6000 feet = 1830 metres between loading coils
(1) Extra light loading
(2) Medium heavy loading
(3) Heavy loading
Velocity, in 1000 miles per second
Henrys per load

Fig. 4. Effect of Loading Upon Velocity of Propagation.

mitted, thus increasing the frequency distortion and so degrading somewhat the quality which was of a very high order on the non-load line.

(3). At about 2,000 cycles, the attenuation of the loaded line undergoes a decided increase, termed the cut-off, so that high frequencies are extinguished.

In addition to these three efforts, the speed of the circuit has fallen from 180,000 miles per second for the unloaded line to 55,000 miles per second for the loaded line.

Fig. 2 shows the results of loading a circuit weighing 20.3 pounds per mile in drycore cable with three different types of coil, each at a spacing of 6,000 feet (1,829 metres). From this we notice four results:

(1). The 800-cycle attenuation has fallen from 0.94 to 0.30 (taking the middle loaded curve as an example), a reduction of 68 per cent in the loss, a greater reduction than was obtained in the case of open wire.

(2). Between 200 and 2,000 cycles the loaded curve is approximately horizontal, indicating that all frequencies between those limits are almost equally transmitted so that the frequency distortion, previously

rather high, is made less, while the non-loaded curve has a pronounced slope; for example, the loss at 2,000 cycles is 1.45—that is, 56 per cent greater than at 800 cycles.

(3). There is the same cut-off effect as

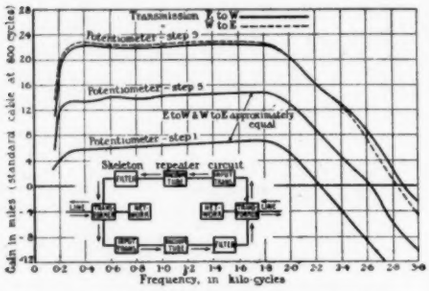

Transmission E to W
W to E
Potentiometer - step 3
Potentiometer - step 5
E to W & W to E approximately equal
Potentiometer - step 1
Skeleton repeater circuit
Gain in miles (standard cable at 800 cycles)
Frequency, in kilo-cycles

Fig. 5. Gain Frequency Curves of 22-Type Repeater.

was noticed on open wire lines when loaded.

(4). The frequency of the cut-off point also falls as the loading increases.

An additional effect is that the speed of the circuit decreases as the loading increases.

Figs. 3 and 4 show the effect of loading on the cut-off frequency and upon the velocity of the cable circuits referred to in Fig. 2.

It is seen that the addition of inductance to circuits, whether open wire or cable, affords a means of greatly extending the distance to which speech is possible, and of reducing the copper required to transmit speech over such distances as were previously feasible. But it is also seen that while loading reduces frequency distortion on the cable circuit, it increases this form of distortion on the open-wire circuit; also that, by increasing the voltage in the circuit, it augments crosstalk and it reduces the speed of propagation in the circuit.

So far as open lines are concerned, the reactions on the general plant caused by loading are that of a higher class of construction, including transportation and maintenance, is required to avoid crosstalk and to keep up the insulation, for loaded lines are much more susceptible to reduction in transmission efficiency due to lowered insulation than are non-loaded lines.

With poor maintenance, it may well be that the number of days in the year during which the improvement due to loading is gained is not sufficient to pay for the cost of loading.

This condition of constantly maintained high insulation applies also to loaded cable lines, but high insulation being comparatively easy to achieve in cables little reaction is caused by this. The increased crosstalk caused by loading has, however, caused real difficulty which has been overcome by great advances in the cable art, not only as regards the construction of long distance cable in the factory, but also as regards the jointing of the wires in the field, both these being intended to secure such freedom from unbalance between circuits as will obviate crosstalk.

It must further be noted that here, as in many of the latest developments, the effect of variables is not necessarily local; that is to say, a defect in one place may be felt a long way off in a section where no defect exists. There was also at one time, but this does not now occur so often, a necessity for great care to guard loading coils from becoming magnetized; this has been avoided in cable loading coils by the use of compressed magnetic dust for the cores.

Repeaters.

Although the telephone repeater has been in service since 1905, it is only since 1914 that the thermionic repeater, which followed the introduction of the grid or third element by de Forest into the two-element thermionic valve of Fleming, has been employed, and the great impetus to its use has only been given during the last five years or so.

The fact that a three-electrode vacuum tube acts as an amplifier of speech cur-

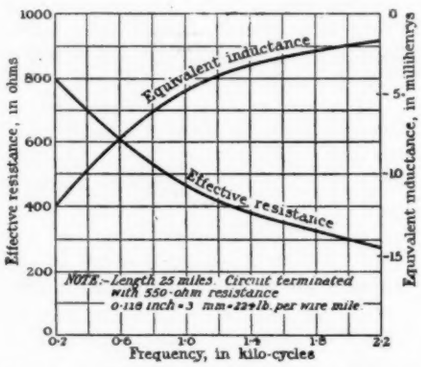

Equivalent inductance
Effective resistance
NOTE.—Length 25 miles. Circuit terminated with 550-ohm resistance
0·118 inch • 3 mm • 22 lb. per wire mile
Effective resistance, in ohms
Equivalent inductance, in millihenrys
Frequency, in kilo-cycles

Fig. 6. Impedance Frequency Curve of 0.118 Inch Open Wire Non-Loaded Line.

rents has led to an idea that a telephone repeater begins and ends in a device which relays the received current very much as does an electromagnetic relay. But the telephone repeater has many important conditions besides the amplifying one and the fact that the reactions on telephone practice, due to the advent of the practical telephone repeater, have been and will be of very special importance, makes it worth while to devote some little time to their consideration.

First, let us look at the general types and their places in the system. There are so far, three general types: First, the repeater which operates in two directions by means of a single amplifying unit, the so-called 21-type repeater.

This must be placed at or near the center point of the line because the impedances of the lines on each side of the repeater act as balances to each other, and if they are not equal, the unbalance will cause circulating currents round the repeater with the result that sustained oscillations will be set up and the repeater will "sing." Up to the present, this type cannot be used in tandem, consequently, its use is limited; it may be applied either to open wire or to cable circuits.

Second, there is the repeater which operates in two directions by means of two unidirectional amplifying units, the so-called 22-type repeater. With this type there is much greater freedom in locating the repeater because the balance is not between the two impedances offered by the lines on each side of the repeater, but between the impedance of one line and that of a network made to simulate the line impedance, and the precision with which the network does simulate its associated line at all speech frequencies, governs the degree of amplification or gain which may be taken from the repeater.

If the balance is not held, circulating currents will cause the repeater to sing. Repeaters of this type are applicable to open wire and to cable circuits; they may be, and are regularly, placed in tandem, and as many as 23 have been used in tandem in regular service on a single conversation. This fact illustrates that the speech currents are transmitted with sufficient accuracy, as otherwise cumulative distortion would quickly cause degradation of articulation to an intolerable extent.

Third, there is the repeater which operates in one direction only, the speech currents in the other direction being provided for by an independent circuit, the so-called four-wire circuit, in which the currents from, say, east to west, are taken by one circuit of two wires, with its unidirectional repeaters in tandem, and the speech currents in the other direction, from west to east, are taken by another circuit of two wires, also furnished with its unidirectional repeaters.

Obviously, if a special four-wire line were set up from Subscriber A to Subscriber B, in which the circuit started with A's transmitter and terminated with B's receiver, and the circuit in the other direction were similarly treated, there

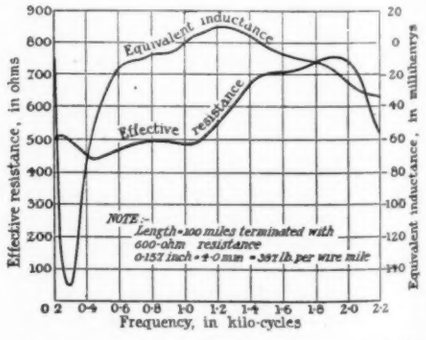

Equivalent inductance
Effective resistance
NOTE:—Length 100 miles terminated with 600-ohm resistance
0·157 inch • 4·0 mm • 39·7 lb. per wire mile
Effective resistance, in ohms
Equivalent inductance, in millihenrys
Frequency, in kilo-cycles

Fig. 7. Impedance Frequency Curve of 0.157 Inch Non-Loaded Open Wire Side Circuit.

could not be any circulating currents at all. Commercially, however, this is not possible, and it is necessary to use the regular two-wire local system, so that only the long line portion of the circuit can be of the four-wire type.

With this type of repeater the circulating currents have to travel a long distance, which gives rise to great attenuation, before they can get back to their starting point for reamplification, and so a much greater gain can be taken from four-wire repeaters than from 21 or 22 types, before the singing condition is approached.

While the four-wire type can be employed on either open or cable circuits, the fact that it requires four wires makes it economically more suited to cable circuits, and since the gains obtainable are high (they can be made so high as to render the line loss zero between the terminals of the four-wire section, which cannot be achieved by any other type), it is economically possible to employ this type of circuit in cable for distances up to 1,000 miles, perhaps farther, and so it is preeminently suited for groups of long distance lines carrying heavy traffic.

Whichever repeaters are employed in any line, they must, of course, be located at the right position determined by engineering considerations alone and not by political ones. It might, for example, be correct for a line to run through Switzerland with no repeater on it at all in that country, or for a line to run through Limburg on which there would be a repeater in Holland, but no appreciable length of line in that state. In any such case the networks at the repeater in one country must conform to the lines situated in other countries.

The fact that telephone repeaters must be employed in tandem renders their requirements very severe. Fig. 5 illustrates the gains obtained from a repeater of the 22 type designed for a loaded cable circuit taken at random and connected to an artificial line. The control of the gain is by a potentiometer with fixed steps, the top curve showing the gains from the two repeaters in the two directions, east and west, for speech frequencies when the two potentiometers were set on the same step,

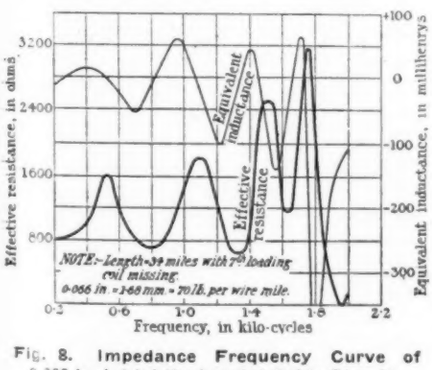

Effective resistance, in ohms
Equivalent inductance, in millihenrys
Equivalent inductance
Effective resistance
NOTE:-Length-34 miles with 7th loading coil missing.
0·066 in. = 1·68 mm. = 70 lb. per wire mile.
Frequency, in kilo-cycles

Fig. 8. Impedance Frequency Curve of 0.066 Inch Lightly-Loaded Cable Circuit.

the 9th. The gain shown in the curve is approximately 22 miles, a current amplification of 11 times.

Of course, it will be realized that this only shows what amplification the repeater can give; in practice one would not expect such gains when connected to real lines. It will be seen how closely alike are the gains in each direction; that is, the speech currents are amplified in either direction with very nearly identical gains. When the potentiometers were set on the fifth step, the gains were reduced, but the curves of the gain in each direction were practically indistinguishable, and the same held good when a still lower gain was taken by putting the potentiometer on the first step.

It will be noticed that these results were obtained not by any careful and fractional adjustment, but merely by setting the two potentiometers on similar steps, and it will also be seen that the variation in gain produced by one step is approximately two standard miles.

The small inset diagram indicates the pieces of apparatus involved, all of which have to play their part in the gain at speech frequencies, viz., potentiometer, input transformer, vacuum tube, output transformer, filter and three winding transformers in each repeating unit. It will be realized that the gain given out by

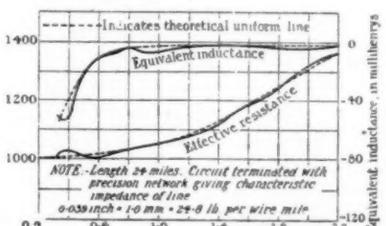

Indicates theoretical uniform line
Equivalent inductance
Effective resistance
NOTE.-Length 24 miles. Circuit terminated with precision network giving characteristic impedance of line
0·039 inch = 1·0 mm. = 24·8 lb. per wire mile.
Equivalent inductance, in millihenrys
Frequency, in kilo-cycles

Fig. 9. Impedance Frequency Curve of 0.039 Inch Phantom Cable Circuit. Medium Heavily-Loaded Cable.

the repeater must, of course, be adjusted to and suitable for the type of line with which it is to be used; also that a repeater is not a universal article which can be attached to any line, regardless of its make-up.

When in actual service repeaters are associated with lines, several reactions occur which very largely modify previous practice. As before stated, the line is balanced by an impedance network which simulates the line, but in order to keep these networks practicable it is necessary that the lines shall be as free as possible from irregularities, otherwise the networks would be very expensive and perhaps impossible.

Fig. 6 shows impedance frequency curves for an open-wire line 41 km. (25.5 miles) long of copper wires having a diameter of 3 mm. (0.108 in.). This is an excellent example and so regular that there is no difficulty in providing a network which closely simulates the line, consequently satisfactory repeater gains can be obtained. The indicated results were found at the first trial and without any clearing up.

Fig. 7, however, shows similar curves for a line that was regarded as a first-class one until tests were made on it prior to using a repeater. It is seen that its impedance curves are very irregular so that in its then state it was quite impossible to employ a repeater. Fig. 8 shows a cable circuit 34 miles (54.7 km.)

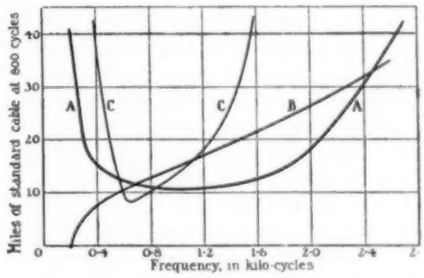


Fig. 10. Attenuation Frequency Characteristics of Long Open Wire Line.

long, from which, for some unknown reason, a loading coil 8 miles (12.9 km.) distant from the place of this test, had been removed.

The impedance frequency curves very plainly show how, by this removal, the line is thrown out of balance with the network, and one can thus see that the removal of the coil would at once render useless the line of which it forms a part. The removal of a loading coil is a noticeable matter, but the want of uniformity introduced by several portions of a line having different constants, such as nonuniformity caused by the haphazard joining up of line not constructed with a view to the rigid uniformity required for repeatered lines, acts in the same fashion.

Fig. 9 shows impedance frequency curves for a phantom loaded cable circuit 39 km. (24 miles) long. It will be remembered that a phantom circuit is one which is obtained by superimposing the phantom on two circuits each composed of two phyical wires.

It is not an easy matter to obtain a low unbalance condition between the various capacities which make up such a circuit. In this figure are shown the curves for the line and for a theoretically uniform line; it will be seen that the actual line does closely approximate to the theoretically perfect line.

Let us now see what is the overall result in transmission when employing a long line in which copper and repeaters both contribute to the effective transmission of speech. What, in fact, is the transmission afforded over the whole system.

In Fig. 10 are shown frequency attenuation curves for a non-loaded, open, copper wire line 3,400 miles (5,472 km.) long. The curves reproduced are: *A*, actual measurements on the line when using repeaters of a type designed for and suited to the line; *B*, computations based on using imaginary repeaters giving uniform gains at all frequencies; *C*, actual measurements when using repeaters suitable for other types of line but unsuited to this one. The line included 12 repeaters in

tandem, and the results are somewhat remarkable.

They show, curve *A*, that the specially designed repeater in conjunction with the suitable line gives a fairly uniform overall loss, approximately 10 standard miles, between the frequencies of 400 and 1,800. On the other hand, curve *B* shows that the theoretical uniform-gain repeater, if used, would be very unsatisfactory, in that it would give a frequency gain characteristic of a very undesirable kind and one which would greatly increase the frequency distortion. Lastly, curve *C* shows that a repeater suited to the character of one line, if used with another line to which it is unsuited, may give overall transmission of a highly unsatisfactory nature.

Since it is not yet practicable to transmit all frequencies equally, it is evident that some sort of a compromise must be made, and if a line is composed of several sections on each of which a different compromise has been made, the final through result may be less satisfactory than need be, solely because of the fact that the compromises contain no unity of treatment.

When repeaters are in operation, they must maintain constant the gains to be given out or there will be serious effect on the speech. If we assume a four-wire circuit between Rotterdam and Milan, 500 miles (810 km.) long and having five repeaters in it, operating at gains of 23, 30, 30, 30 and 23 standard miles (S. M.) respectively, say an average of 27.2 each, we need only consider what will happen if the gains fall off, since the gains will originally have been set to be as high as safely allowable.

Assume, then, that the line without repeaters has a net equivalent of 148 S.M. from which we deduct the repeater gains, $5 \times 27.2 = 136$, leaving the net loss $= 12$ S.M. Now suppose the gain at each repeater station for any reason at all falls off by 2 per cent, this will represent 0.54 S.M. each or 2.7 S.M. for the five stations, and the net result will then be increased from 12 to 14.7 S.M., an increase of 23 per cent in the loss in the line.

Should the gain on each repeater fall by 7.5 per cent the total additional loss will be 10.1 S.M., and the final net loss will be increased from 12 to 22.1 S.M., an increase of 84.5 per cent. In this case the loss would be so great that probably the line would become unworkable.

I have chosen these examples to show the importance of uniformity of construction, uniformity of maintenance, and uniformity of operation; it will be seen afterwards what is their particular application. The examples are rather understated than exaggerated. It would have been quite reasonable to have taken a case with 20 repeater stations in tandem, and, furthermore, the gain given by a repeater would not in fact be one definite figure for all frequencies.

To My Friend, the Public Utility Man.

My hat is off to you, sir,
  And the business you pursue;
It may not bring the loud applause
  Or the luxuries for you;
It may not bring the "Thank you's"
  Or a great amount of praise,
And perhaps it calls you early—
  Keeps you working all your days.

You must delve away untiring
  So your service will not stop.
You must tell why rates that now are low
  Aren't scheduled to drop.
You must grow a little faster
  Than the city where you dwell
And be ready to deliver
  On demands one can't foretell.

While you fight the wind and lightning,
  Fight the flood, the sleet, and fire!
As you're digging for the frozen pipes,
  Repairing broken wire—
You are serving all your fellow men
  In a most substantial way,
Through all the hours of day or night,
  And you keep no holiday.

There's a heap of satisfaction
  In a task that is well done;
If only folks appreciate
  The service that's "A-one."
So I voice my admiration
  At this season of good cheer,
And wish you health and happiness
  Throughout the coming year.

JOHN N. CADBY,
Secretary, Wisconsin Utilities Association.
He who serves those who serve all.
Written Sunday, Dec. 17, 1922.
(We never rhyme during office hours.)

Fortunately, the design of repeaters has been carried far enough so that if correct design is employed and if certain regulations for operating routine and maintenance are followed, the gains can be held steadily, but among those routines are tests which determine when the useful life of an amplifying element, a vacuum tube, has ceased and the required constancy in gain can only be held if all repeater stations are operating to the same routine.

If the line is an aerial one and subject to considerable changes in temperature, the resistance alters and another source of variation in overall transmission equivalent is introduced. If these changes are serious, they can be compensated automatically; if not so serious, they can be dealt with by operative routine. The lesson is, however, the same in either case, and, for the best results, those persons operating the various repeater stations must be operating to the same routine, employing the same technique and under the one control.

Again, when breakdowns occur, important circuits cannot stand out of order, but must immediately be temporarily rerouted to restore the service. Such alteration may affect the balance between the network and line at the repeater station and this may have to be dealt with by altering the gain of one repeater (in which case alterations will probably be required at all other repeater stations along the line), or by changing networks.

If it were possible to foresee all possible combinations and emergencies, it would doubtless be possible, though not economical, to establish routines covering all cases requiring attention, but obviously this is not possible and the only commercial solution lies in unity of control of the line from beginning to end.

It has been shown that the result of loading the circuit is reduced attenuation and somewhat impaired articulation in open-wire circuits, and reduced attenuation and better articulation in cable circuits. Now that the use of repeaters has become possible, additional energy can be put into the line as required and the attenuation can be reduced by that means.

It is therefore, no longer necessary to sacrifice the quality which can be obtained on open-wire circuits by loading them in order to reduce the attenuation; this reduction can be effected by repeaters. In cable circuits, however, it was shown that loading was necessary to reduce the frequency distortion.

Consequently, long, heavy, open-wire lines are not now loaded at all but are repeatered, resulting in improved articulation, and the increased speed of propagation avoids echo trouble which only became insistent because of the more powerful effects derived from repeaters. With cable circuits, on the other hand, loading still obtains; it cannot be abandoned since it is necessary for the reduction of frequency distortion, but the tendency is towards lighter loading so as to raise the speed of the circuit, thus reducing the echo trouble which, because of the reduced speed and the great electrical length of loaded cable circuits, demands most careful consideration. *(To be continued.)*

Illinois District Meeting to Demonstrate Cable Splicing.

The January district meeting of the Illinois Telephone Association will be held at the Association of Commerce headquarters at Monmouth, Ill., Tuesday, January 30, beginning at 9 a. m.

This district meeting will include not only the usual operators' traffic conference, but will also include a plant school for telephone men in which a practical demonstration of approved cable splicing methods will be given. No northern Illinois telephone executive or employe in an executive position can afford to miss this conference, and it is expected by the officers of the association that a very large number will be present.

The officers of the association will be prepared to report on pending and proposed legislation.

Information as to hotel accommodations can be secured from Fred A. Norris, general manager of the Monmouth Telephone Co., and a director of the Illinois Telephone Association.

South Dakota Holds Best Meeting

Seventh Annual Meeting of The South Dakota Telephone Association at Huron Last Week Developed Great Interest in Organization's Work—Increasing Activities Planned as Result of Past Year's Successful Work

Surpassing its former conventions, the South Dakota Telephone Asociation held its seventh annual meeting January 17, 18 and 19 at the Marvin-Hughitt Hotel in Huron, and created the highest enthusiasm that has yet been shown in the association's affairs. The remarks heard during and after the sessions proved that the members and visitors—there were over 100 present—derived many benefits from their attendance and gained information that was of real value.

It could scarcely have been otherwise, for great care had been exercised in making up a program that would be of benefit to every member. The papers and talks presented had to do with matters of general interest to all and offered some new ideas for the advancement of the companies and the industry.

The manufacturers coöperated to make their share of the convention a success and as a result the display of telephone equipment attracted the attention of the visitors and much interest was shown.

Officers elected to head the association for the ensuing year are: President, L. H. Snyder, of White Lake; vice-president, J. J. Bollinger, of Bridgewater; secretary-treasurer, Thos. J. Phalen, of Aberdeen.

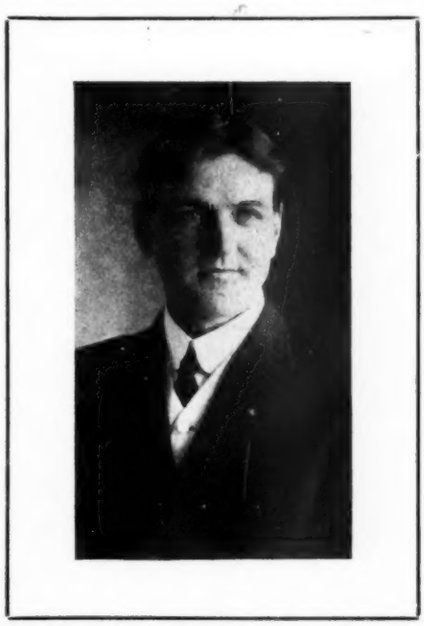
Retiring President J. A. Steninger, of Parker, Still Serves the Association. He Is a Director.

The board of directors comprises: J. A. Steninger, of Parker, retiring president of the association; M. E. Guinter, Sioux Falls; A. L. Curtis, Castlewood; F. L. Wheeler, Scotland. The officers and directors constiute the executive board.

The meeting was called to order at 10:15 a. m. on Wednesday, January 17, by President J. A. Steninger, of Parker.

The address of welcome was given by J. M. Moran, representing the mayor of Huron, to which C. E. Hall, of Omaha, Neb., tax commissioner of the Northwestern Bell Telephone Co., responded.

Secretary-Treasurer Thos. J. Phalen, of Aberdeen, superintendent of traffic of the Dakota Central Telephone Co., read the minutes of last year's convention at Mitchell, and presented his report of the association's activities during the year. A vote of thanks was tendered Mr. Phalen



President L. H. Snyder, of White Lake, Began Telephone Work in 1899 as a Lineman and Inside Wireman.

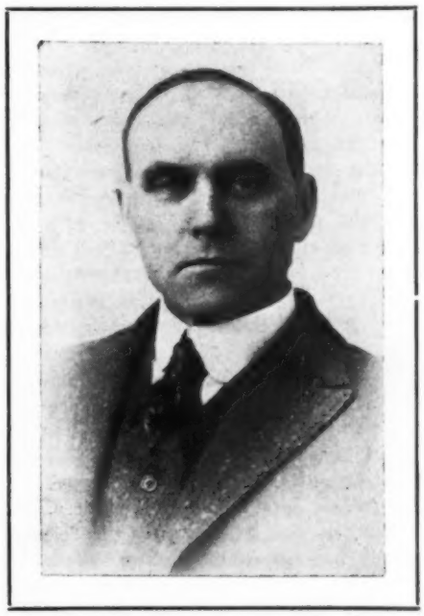
for the thoroughness of the report and the efficient manner in which it had been compiled.

President Steninger then delivered the president's annual address. He expressed himself as being "strong for" district meetings and recommended that the state be divided into distinct divisions so that there could be a regular program of meetings.

He urged that all classes of telephone people—directors, management, traffic, plant, and operating departments—familiarize themselves as much as possible with the branches of the industry other than their own, so that they may have a general knowledge of how service is rendered, and may talk intelligently to the patrons, as well as work together more efficiently and understandingly.

Mr. Steninger insisted that the public is entitled to standardized, unified service, rendered in a capable and satisfactory manner.

He referred to the loss suffered by the association in the deaths of J. L. W. Zietlow, of Aberdeen, and J. Wilson, of Groton.



Secretary-Treasurer Thos. J. Phalen, of Aberdeen, Received a Vote of Appreciation of His Work, and Another Year of the "Job."

The reports of the various committees acting during the year were presented. A. S. Kelly, of Omaha, Neb., made the report for the legislative committee; Thos. Phalen for the traffic committee; and M. E. Guinter, of Sioux Falls, district commercial manager of the Northwestern Bell, for the public relations committee.

The following convention committees were then appointed by the president:

Resolutions: C. E. Hall, of Omaha, chairman; A. N. Van Camp, of Highmore, and C. L. Adams.

Nominating: J. F. Zietlow, of Aberdeen, chairman; F. L. Wheeler, and H. M. Schumacker.

The meeting then adjourned, reconvening at 2 o'clock in the afternoon. That session was devoted to short talks relative to telephone conditions in the state. Those taking part in the discussions were: A. N. Van Camp; J. J. Bollinger, of Bridgewater; C. L. Adams, H. P. Mortenson and A. L. Berg.

The second day was a very busy one, being devoted principally to a plant school for the study of the workings of an exchange, its problems and difficulties. Sev-

eral instructive and beneficial papers on construction, maintenance, and inductive interference were read.

A first aid demonstration that was very impressive was given under the direction of D. Dunham, of Omaha, Neb., who also made an address explanatory of the points brought out in the demonstration.

"Construction of Outside Plant," was the subject of an address by R. Y. Hyde, of Omaha, Neb., in which he handled in a most thorough style the matters which confront the company when undertaking outside work, telling how advance planning aids in pushing the work through at the proper time and in the proper manner.

The little points which perplex the management, as well as the general policies which make the going somewhat easier, were dealt with by George T. Gorham, of Omaha, Neb., in "Maintenance of Central Office and Subscribers' Equipment."

The afternoon session opened with the report of the nominating committee for officers for the ensuing year. This was adopted and the nominees declared elected by an unanimous vote.

The election of officers was followed by a talk by J. J. Murphy, of the South Dakota Railroad Commission, and one on "Maintenance of Outside Plant," by G. E. Beatty, of Sioux Falls.

W. G. Bickelhaupt, of Aberdeen, president of the Dakota Central Telephone, and chairman of the legislative committee, presented his report, and then spoke on "Past and Proposed Legislation." He pointed out that the way to avoid adverse legislation is to give the public good service—in fact, that the telephone user wants the best service there is to be had, and will pay the price for it.

The final day's program brought forth some interesting papers and discussions.

Verne C. Kennedy, of Sioux Falls, consulting engineer, speaking on "Inductive Interference," showed the necessity for great care to be taken when both power and communication wires are strung on the same poles.

The duties of the national association to the state associations were discussed by Chas. C. Deering, of Des Moines, Iowa, secretary-treasurer of the United States Independent Telephone Association. He explained that the national association is in a position to take up matters affecting the smaller as well as the larger companies; that it is in close touch with the Interstate Commerce Commission and Internal Revenue Department; and, therefore, that it can be of material service to state associations.

Developing the topic, "Legislative Matters," H. P. Hartwell, of Irene, outlined the effect of laws now on the statute books, together with remarks on some proposed legislation.

In the afternoon, round table discussions were in order and several matters relating to the telephone business as a whole were taken up. The representatives of manufacturers and jobbers were also called upon individually to say a few words.

At the close of these remarks a resolution was introduced to appoint a committee to devise ways and means for arriving at a just and fair compensation for handling toll business between connecting exchange companies.

The new president, L. H. Snyder, outlined his policy for the coming year, and made the following appointments of committees to assist in carrying on the work of the association:

Legislative: W. G. Bickelhaupt; A. S. Kelly and J. K. Seckler, of Faulkton.

Traffic: J. J. Gibbs, Sioux Falls; T. J. Phalen and A. N. Van Camp.

Public Relations: M. E. Guinter; F. L. Wheeler, Scotland, and T. J. Phalen.

Taxation: C. E. Hall; W. G. Bickelhaupt and L. H. Snyder.

Auditing: J. J. Bollinger; F. L. Wheeler and T. H. McCullough, of Avon.

Resolutions: C. E. Hall; A. N. Van Camp and Ira S. Burdette, of Armour.

The report of the resolutions committee, presented by Chairman C. E. Hall, touched upon many important phases of the telephone business. Provisions were made for perfecting the service by holding operators' and plant schools. Resolutions were passed also upon the deaths of J. L. W. Zietlow and J. Wilson.

Short talks were then made by retiring President J. A. Steninger, Frank A. May, L. B. Wilson and L. M. Holliday, all of Omaha, Neb., after which the convention adjourned.

The banquet held on Friday evening gave the convention just the right finish. Practically every person attending the meetings stayed for the banquet and none expressed regret at having done so. It was a get-together affair, with entertainment, general singing and good eats.

Retiring President Steninger acted as toastmaster, and short talks were made by W. G. Bickelhaupt, C. C. Deering, H. P. Hartwell, T. H. Null, of Huron, and representatives of the Rotary, Kiwanis, Commercial and Lions clubs.

The concensus of opinion as expressed by groups in the halls at the time of breaking up was a "Coueism"—the South Dakota association never retrogresses and never shall; it keeps on growing in size and scope of activities, and it's going to get "better and better."

To the Marysville Operators

By Miss Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa.

Nine persons were given a pack to carry. As the contents of the pack were in great demand by the residents in the town of Prosperity Heights, at any hour of the day or night, this pack could never be closed.

Because of the continuous service which was required, these nine persons carried the pack in relays. When the demand for its contents was greatest, four of these people carried the pack, while a fifth kept watch to see that everyone who made a request was properly served. When the demand was not so great, three persons carried the pack while a fourth kept watch. During the night hours the pack was so light that it required only one person to carry it.

The residents of Prosperity Heights have come to depend thoroughly on the service of these nine persons. It would be a real tragedy if suddenly they were spirited away with their pack of precious contents.

Although we are not living in fairyland days, these nine persons are rendering *real* fairyland service. If a doctor is wanted, ask Central—and lo, he speaks. Ask for anyone—the butcher, the baker, the candlestick maker; quicker than the snap of a finger, he speaks. Could the fairies do any better?

Telephone service is real, honest-to-goodness service.

Washington Company Extending System—Buys Two Exchanges.

The Interstate Utilities Co., of Spokane, Wash., operating in Washington, Idaho and Montana, has extended its system by the purchase of exchanges and equipment at Tekoa, Wash., and Plummer, Idaho. The Tekoa exchange has 400 stations city and rural, and the Plummer 100.

The standard of the exchanges will be raised as rapidly as possible, according to a statement of Frank Davies, assistant superintendent. A two-wire line will be built from Tekoa to Plummer and at Plummer a connection will be made with the system of the Interstate Utilities Co. The line from Tekoa to Plummer will serve rural communities and lumber mills in the region between those places.

Purchase of the Tekoa exchange was made from E. H. Cookingham, of Spokane, who operated it for two years. The Plummer exchange was bought from T. J. Moran.

Rochester, Minn., Company Now Under Tri-State Name.

The name of the Rochester Telephone Co., Rochester, Minn., was changed to the Tri-State Telephone & Telegraph Co., effective January 1, in conformity with an order issued from the general offices of the Tri-State company in St. Paul and announced by R. F. Wilder, commercial superintendent.

The Rochester company was owned and operated by the Tri-State for some months prior to the time a decision was reached to change the name.

Commissions, Courts and Councils

Discussion and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service

The Work of the Kansas Public Utilities Commission.

Commissioner Jesse W. Greenleaf of the Kansas Public Utilities Commission, in a letter to TELEPHONY dated January 8, which was received January 19, presents data to show that the commission is disposing of cases coming before it promptly, and with a very fair treatment of telephone companies.

Commissioner Greenleaf writes:

"The present Public Utilities Commission of Kansas was organized at the close of the 1921 legislature, March 23, 1921. Since that time the commission has definitely disposed of 219 telephone cases. This does not include cases in the process of settlement; cases in which temporary orders have been issued; and scores of telephone matters adjusted informally.

Of the above 219 cases, 116 were either strictly rate cases or were applications for authority to discontinue free service. In 48 cases the full increase applied for was authorized. In 46 cases partial increase applied for was authorized. In six cases increase was refused. In nine cases reductions were ordered. In seven cases the commission authorized the discontinuance of free service.

The commission has refused to allow what seemed to it to be exorbitant rates and charges in telephone service, but it has granted every application that seemed just and reasonable.

We think a study of these decisions will show a very fair treatment of telephone companies, whose subscribers have been going through very trying times financially, due primarily to the low prices of agricultural products. The commission has endeavored to work in a constructive way with all the telephone companies and has given all the help at its command in assisting small struggling companies to iron out their difficulties when they have applied to us for help in any way.

We have endeavored to dispose of every case promptly. It has been the policy of the commission to set every case for hearing as soon as an open date could be found on the calendar and proper notice could be given to the public of the hearing. At this time orders have been issued in every case that has been heard excepting a few in which there is a good cause for delay, understood and agreed to by the company.

The commission thinks the editorial comments appearing from time to time in TELEPHONY criticizing the Kansas commission has been unfair and due to the misapprehension of the true conditions and facts."

[EDITOR'S NOTE: In the interest of fairness, TELEPHONY cheerfully gives space to the foregoing letter from the Kansas Public Utilities commissioner, and affords the commission an opportunity to present its record.

TELEPHONY has criticized the manner in which that body handled many utility cases, and from time to time referred to the frequent instances in which the courts have come to the rescue of service companies and overruled the commission's orders.

No doubt, the fall in farm prices financially pinched telephone subscribers, but the fact remains that telephone service is the cheapest commodity the farmer buys, and that telephone companies deserve better rates in most cases.

If the commission adheres to a policy of handling rate cases promptly, it will be an advantage to all concerned.]

Southern Bell Ordered to Improve Service in Albama Town.

An order requiring the Southern Bell Telephone & Telegraph Co. to furnish improved equipment and service at Sylacauga, was issued by the Alabama Public Service Commission on January 5. The order was entered upon petition by the city of Sylacauga, which was considered some time ago.

It was ordered that the day service be extended half an hour later at night to conform to the usual closing hour of drug stores in the city; that a sufficient number of operators be employed at all times to render adequate service during the day and to provide a competent operator in its office to answer the night bell and to render service to the public after office hours.

The company is required to report to the commission in writing within 30 days what steps it has taken to comply with the order.

Hearing Held on Rate Petition of Miami, Fla., Company.

A hearing which went in detail into the affairs of the South Atlantic Telephone & Telegraph Co., of Miami, Fla., was held before the Florida Railroad Commission in Miami, January 10. The company is asking higher rates, necessary to induce new capital to meet requirements of about $500,000 per year for the next five years.

After the hearing Chairman R. H. Burr, of the commission, said that the matter would be taken under advisement. He declared that very conservative statements had been made by the company's witnesses—especially on the question of a proper investment return. At former hearings, Mr. Burr said, bankers and other business men had testified that any business should have a net return of from 12 to 20 per cent.

He explained that he had made a careful survey of conditions and found that the company had been operating at a loss. He found no discrepancies of importance in the accounts, and arrived at practically the same estimate as the company for future requirements.

Mr. Greene was impressed by the efficiency with which the company's business had been conducted, declaring that nowhere had he found waste of any sort but that everything was in high grade condition. He praised the manner in which F. W. Webster, general manager, had conducted the affairs of the South Atlantic company.

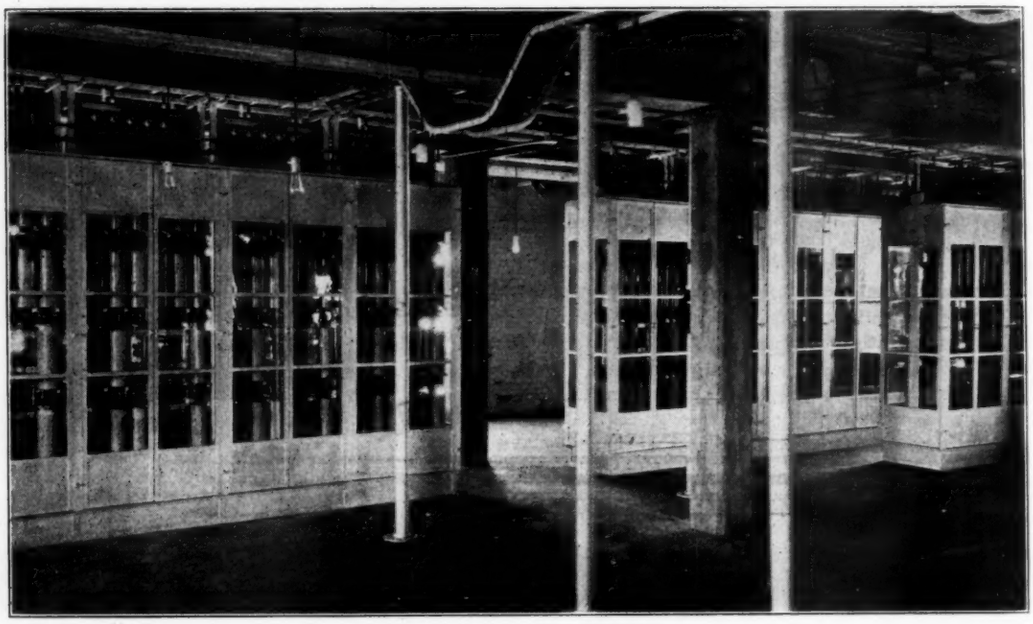
Frank B. Shutts, president of the company, was on the stand for a considerable time, and told how important it was that funds be secured to keep the growth of the company in line with the city's growth. He said further that the Southern Bell Telephone & Telegraph Co. had taken over all treasury stock at par and had bought all other stock, and that now—with the exception of a few shares—the Southern Bell owned the local company.

Several business men who are subscribers testified their willingness to stand the increase, and letters from subscribers and resolutions by civic organizations in agreement were introduced.

R. J. Gailbreath, auditor and secretary of the company, presented figures to show that a profit of 5.53 per cent had been earned in 1915; that there was a deficit in 1919; a net return of 2.25 per cent in 1921; and an 8 per cent loss has been suffered in 1922.

General Manager Webster gave a detailed account of the present equipment of the company and its estimated needs for the future. Referring to the Southern Bell, he said that that company had dealt with the South Atlantic in a strictly advisory capacity, leaving the management in the hands of the local organization, and that it had never attempted to override the judgment of Miami management.

Regarding the automatic service, Mr. Webster explained that while the item of operators' salaries was decreased, more men were required in the traffic department and at higher salaries than the girls. He also stated that of 183 replies to a letter sent out by Mr. Shutt, asking opinions and criticisms on the automatic, 170 praised it, three—through a misunderstanding—were dissatisfied, while the remaining 10 were experiencing some sort of trouble but liked the automatic system.



In the two-office automatic exchange at Long Beach, Cal., all of the party lines are served by one standard type of frequency connector. Many other exchanges, as well, ranging in size from a few hundred lines to several thousand, are finding this method simple, efficient and satisfactory in every way.

An Efficient Party Line Connector

THE frequency-selecting connector (the standard Strowger connector, equipped with a minor switch for harmonic selection of party line stations in Strowger exchanges) offers a number of advantages that all telephone men, especially those operating exchanges in small towns, should understand.

Following are some of the most important features offered by the use of this type of connector:

1. It increases the efficiency of the connector equipment by decreasing the number of connectors needed. Each 100 party line unit is equipped with one group of connectors instead of the two or four groups used in very large exchanges.

2. The same type of connector is used for individual lines, party lines and rural lines. This permits the use of a standard 100 line unit, and lines having different classes of service may, if desired, be combined in the same unit.

3. The frequency connector offers full selective (harmonic) ringing on lines having from one to ten stations.

4. Since segregation of various classes of service is not necessary, every unit may be used to its full capacity.

5. The service rendered by this equipment is in every way equal to that offered by large city automatic exchanges.

6. The use of the frequency connector means low first cost and low maintenance cost.

Automatic Electric Company

FACTORY AND GENERAL OFFICES: CHICAGO, ILLINOIS.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

ASSOCIATED COMPANIES

INTERNATIONAL TELEPHONE SALES AND ENGINEERING CORPORATION, New York

International Automatic Telephone Company, Ltd. London.

Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston Paris

Automatic Telephone Mfg. Co., Ltd., Liverpool.

Automatic Telephones, Australasia, Ltd., Sydney

Mr. Webster estimated that by the end of 1924 the present number of 7,803 stations would be increased to 10,228—with a gain of about 1,800 stations in 1923.

W. A. Jamieson, plant chief, gave detailed information regarding figures arrived at in the appraisal of the physical property of the company, saying that all wires and cables of the company had been measured; poles and crossarms examined and those deteriorated given proper depreciation, ranging from 5 to 18 per cent. Instruments were inspected, 100 in residents and 100 business telephones, and an average taken.

The total valuation, including the valuation as going concern, was given as $1,823,596. The plant value, including Miami Beach and toll, but exclusive of intangible property, was given as $1,634,131. Reproduction cost was listed at $1,543,780; going concern value as $153,674; material and supplies, $27,808. These figures coincided with those given by the commission engineer.

Mr. Gailbreath also testified that a monthly depreciation of 5.47 per cent was applied to the reserve fund.

New Rate Schedule Ordered for Service in Bushnell, Ill.

The Illinois Commerce Commission has annulled the schedule of rates filed by the Mann Telephone Co., of Bushnell, and made the following schedule effective February 1:

Business, one party	$2.50
Residence, one-party	1.75
Residence, two-party	1.50
Residence, four-party	1.17
Extension sets	.50

Louisiana Commission Rejects Compromise—Reduces Rates.

Just when it seemed that a compromise on the Louisiana rates could be effected between the Cumberland Bell Telephone & Telegraph Co. and the committee representing the various cities of the state, the Louisiana Public Service Commission entered an order rejecting the schedules proposed by both groups and establishing rates which wipe out from 50 to 100 per cent of the increases granted last May. The order was entered January 13, after a hearing lasting three days.

In addition to the slash in rates, the order also provides that the company refund to subscribers approximately $440,000—the difference between the pre-war rate and the present rate for the period beginning May 13, 1922, the date the present rates became effective.

The increases granted last May amounted to approximately 20 per cent. The new order cuts this down to about 6 per cent, according to officials of the company.

On January 11 the Cumberland Bell submitted a schedule of reduced rates as a basis to end litigation that may prevent extension of the service for years, but this was promptly rejected when Huey P. Long, chairman, declared the commission would stand for no compromise. The company, however, was permitted to proceed with the introduction of evidence in support of its claim that the rates in the proposed schedule were justifiable.

The announcement of the chairman came after City Attorney I. T. Kittredge, speaking for the traffic and commercial interests represented at the hearing, had asked for one more day's time in which to prepare and submit a counter proposal. Mr. Kittredge said a majority of the organizations represented were in favor of a compromise. The counter-proposal was submitted the following day.

The January 11 session of the commission was devoted largely to the schedule of lower rates proposed by the Cumberland Bell company and the effect on the 95 exchanges throughout the state. Reductions ranging from 25 cents to $1 would total annually for the whole state approximately $250,000. The present rates produce a revenue of something more than $500,000 in excess of those in effect prior to the war, it was said. The reduction offered was almost 50 per cent of the increase.

Hunt Chipley, counsel for the company, asserted that the proposal was evidence of the company's desire to end litigation and to go ahead with the extensive program it has mapped out for New Orleans and Louisiana. These improvements provide for the expenditure of many millions of dollars in the next four years, he said.

The counter-proposal of the citizens' committee—which the commission also rejected—stated that if the company and populace were able to reach an amicable adjustment of the telephone rates throughout the state, all litigation both in the the federal court and before the Louisiana Public Service Commission would cease.

It was also stated that both the committee and the telephone company should agree to make the rates decided upon retroactive to May 13, 1922, and that a reduction of 50 per cent from the new rates should apply to all telephones used in New Orleans, Lake Charles, Monroe, Alexandria, Baton Rouge and Shreveport.

Because of the interest shown in the matter by the telephone company attorneys and the straighforwardness of the committee in the counter-proposal, it was thought that an agreement might be reached which would end the squabble of such long standing over the telephone rates, but a period of litigation now seems imminent.

If the company accepts the order, the increase over the pre-war rates in New Orleans and Shreveport will be reduced 50 per cent.

All other towns in the state where Bell telephones are used would get reductions ranging from 60 to 100 per cent of the increase.

The rates ordered by the commission, together with the rates which have been effective, are:

	Old rates.	New rates.
New Orleans—		
Business	$10.00	$9.00
Residence:		
One-party	5.00	4.50
Two-party	4.00	3.50
Shreveport—		
Business	6.25	5.65
Residence:		
One-party	3.00	2.50
Two-party	2.50	1.90
Alexandria and Baton Rouge—		
Business	5.60	4.95
Residence:		
One-party	3.00	2.70
Two-party	2.50	2.20
Lake Charles and Monroe—		
Business	5.60	4.95
Residence:		
One-party	2.80	2.45
Two-party	2.20	1.95
Crowley, Lafayette, New Iberia, and Bogalusa—		
Business	4.35	3.75
Residence:		
One-party	2.50	2.15
Two-party	2.20	1.90

The rates at the remaining exchanges go back to what they were before the war.

The case which was to have been called in the federal district court January 12, to decide whether or not the commission was right in ordering the rates reduced was continued by consent of both sides pending hearing before the commission.

Bell Asks That New York City Be Kept Out of Federal Suit.

The New York Telephone Co. filed a protest in the United States Supreme Court on January 15 seeking to prevent the city of New York from intervening as a friend of the court in the appeal of the New York Public Service Commission from an adverse decision in the lower federal courts on its orders prescribing telephone rates throughout the state.

"The attempt of the city to inject itself into this proceeding," the brief of the telephone company stated, "is an effort to obtain by indirection what has been denied to it already upon a direct application."

Protest was taken under advisement.

City of Duluth, Minn., Loses Motion for Appeal on Rates.

Telephone subscribers in Duluth, Minn., must pay the increased rates granted the Northwestern Bell Telephone Co. by the Minnesota Railroad & Warehouse Commission on December 28. Such was the decision of District Judge W. A. Cant on January 13, when he granted the motion of the Bell company asking that the city's appeal be dismissed.

F. E. Randall, of Omaha, Neb., attorney for the company, contended that the city had no authority to institute an ap-

peal, as it was not a party to the proceedings before the commission.

The city declared that the order in question was but a continuation of an earlier proceeding before the commission, in which the city of Duluth was made a party, and, second, that the case could be distinguished from the facts in the so-called Tri-State case.

Judge Cant, in his opinion, said he could not agree with either contention of the city. He thought it would be straining a point to grant that the latest order of the commission was a continuation of the former proceeding. As to the Tri-State case, the judge held that it stood as a bar to admitting the city as a party. He held that an appeal could only be made by the attorney general.

Nebraska Commission Rules on Financial Methods.

The Nebraska State Railway Commission, in an order just issued, says that it is reluctant to tell telephone companies how much salaries they must or must not pay officers, but that it thinks $200 a month is all the manager of an exchange of 800 stations ought to ask for all that he might be called upon to do.

The order was one granting the Pawnee Telephone Co., of Pawnee City, a 50-cent monthly increase in its individual and two-party business rates, making them $3 and $2.75 net respectively. The company had asked for a dollar increase on each and a $1.50 rate for business extensions, now a dollar.

Business men of the city had protested against any increase. They said that George E. Becker, manager, who is principal owner, was drawing too much money. The commission's investigation disclosed that Mr. Becker had been putting in a great deal of extra time for which he charged, in addition to $150 a month.

The business men complained that the financial condition of the company was due to a too easy-going collection policy. The commission met this situation by a ruling allowing 1½ per cent for bad collections, and said that all in excess of that would be at the expense of the stockholders and not of the rate payers.

The company owns property of a valuation of $68,000, and although it has paid only a 3 per cent dividend in three years, the commission finds it has been earning close to 7 per cent and putting the money into additions and betterments. These are figured at $4,000. The added revenue will be around $500 a year, which will be made a sufficient return. Mr. Becker said he should have $1,300 a year more.

The commission was asked by the company to decide if it had the right to use earnings to retire stock so that the amount of outstanding securities would not be in excess of the value of the property. The commission said it could do this, but that this money must come from the net earnings and not from the rate-payer.

Nebraska Commission Authorizes Half-Million Stock Issue.

The Nebraska State Railway Commission has granted permission to the Lincoln Telephone & Telegraph Co. to issue $500,000 additional common stock. At the present time the company has an authorized capital of $11,000,000, of which $3,500,000 is common, $100,000 preferred and $7,500,000 special preferred.

Of this amount there is issued and outstanding, $2,823,032 of common stock, $34,581 of preferred and $3,926,000 of special preferred. With the $1,500,000 of bonds, this makes total capital liabilities of $8,284,113. The company's last annual report showed assets of $10,263,400 and plant values of $9,243,033. The commission finds that the margin is ample to permit the issue asked for.

The application has been pending for some months, being delayed from time to time at the request of the commission. It was taken up at this time only because the company had exhausted its previous authorized issue and is in need of money to reimburse the treasury for additions and betterments in place.

The company submitted a statement showing the net additions to its plant for the years, 1920, 1921 and eight months of 1922, of a total of $1,423,405.19. The books of the company are kept according to the Interstate Commerce Commission's uniform accounting system and make careful separation between expenditures for operating expenses, replacements and additions to plant. The figures submitted by the company have been checked by the telephone accountant of the commission and found to be correct.

In 1920 the company was authorized to issue $300,000 of bonds. This money was used for the sole purpose of defraying the cost of additions and betterments. Deducting this from the net additions of the two years and eight months and there remains $1,123,000, or more than twice the amount asked for.

In closing the commission said:

"This commission has been so fortunate in recent years as to be able to place a very considerable portion of its securities in the form of its common stock in the territory which it serves. It has sold this stock at par and at a minimum of cost. The common stock has earned 7 per cent interest so that the financing of additions and betterments on this basis is at a comparatively moderate cost. The company is to be commended for its efforts to place its securities among its own patrons and in the territory served."

Oklahoma Commission Cuts Removal Charges.

Charges made by telephone companies operating in Oklahoma for removal of instruments were reduced approximately 15 per cent, by an order of the Oklahoma Corporation Commission issued January 8. A uniform rate of charges for such service was provided.

As an instance of the reduction, the new rate for removals in Oklahoma City is $3, compared with the former rate of $3.50.

The order prohibits making charges for changing numbers and for listing in classified business directories. It also provides that when five days' advance notice of desired removal is given by a subscriber and because of non-removal the subscribers received no telephone service for ten days, bills must be adjusted so that no charge is made for the period to which no service is given.

Stock Issue by Wisconsin Company to Pay for Extensions.

A new capital stock issue totaling $1,050 was authorized for the Manitowoc & Northern Telephone Co. by the Wisconsin Railroad Commission's order of January 9 The issue is divided into 21 shares of the par value of $50 each.

The stock is to be sold for cash only and the funds to be used for additions.

Summary of Commission Rulings and Schedule of Hearings.

INTERSTATE COMMERCE COMMISSION.

January 15: Application filed by Northwestern Bell Telephone Co. for authority to acquire the property of Musson Brothers, in the vicintiy of Atlantic, Iowa.

CALIFORNIA.

January 12: Permission requested by California Telephone & Light Co., operating telephone and telegraph systems in portions of Sonoma, Napa, Lake and Mendocino counties, to make a charge for messenger service not to exceed 25 cents.

January 13: Application filed by Inyo Coöperative Telephone Co., of Lone Pine, for a permit to sell its property and franchise privileges to the United States Government.

January 13: Complaint filed by the city of Huntington Beach against the Huntington Beach Telephone Co., the Pacific Telephone & Telegraph Co., and the United States Telephone & Telegraph Co., alleging that present equipment of the Huntington company is inadequate to handle the business and asking that improved equipment be installed and other improvements made.

FLORIDA.

January 10: Hearing held in Miami on application of South Atlantic Telephone & Telegraph Co., of Miami, for increased rates.

ILLINOIS.

December 14: Order entered permanently canceling rate schedule IPUC 2 of Monmouth Telephone Co. for service in Monmouth and vicinity, and ordering that schedule ICC 3 be filed; effective January 1.

January 3: Order entered dismissing complaint of the residents of Will County against the Illinois Bell Telephone Co. for inadequate service.

January 3: Approval given to sale by the Illinois Bell Telephone Co. to the Cerro Gordo Telephone Co., of Cerro Gordo, of a piece of exchange rural pole line and circuits in Oakley, for the sum of $80.

January 3: Agreement dated November 1, 1922, between L. E. & W. Railroad Co.

and the Deer Creek Telephone Co., of Deer Creek, relating to installation and maintenance of an underground crossing at Goodfield; approved.

January 3: Approval given to supplemental agreement dated July 1, 1922, between Illinois Bell Telephone Co. and the Dixon Home Telephone Co., of Dixon, for the inclusion in the toll traffic agreement and toll line supplemental traffic agreement, approved May 3, 1921, of an iron metallic circuit between Dixon and Sterling, for the purpose of handling local traffic.

January 3: Approval given to intercorporate agreement dated September 1, 1922, between Illinois Bell Telephone Co. and Camp Point Telephone Co., of Camp Point, for the connection of the toll lines of the former to the switchboard of the latter, for the handling of toll messages.

January 3: Order entered permitting the Southwestern Bell Telephone Co. to purchase the Kinloch Long Distance Telephone Co., of St. Louis, Mo., and authorizing the Kinloch Telephone Co. to sell all assets, property and rights now owned by it and located in Illinois.

January 3: Order entered approving the rates set forth in schedule IPUC 2 of the Kinloch Long Distance Telephone Co. and the Kinloch Telephone Co. for cities named in the petition.

January 3: Order entered directing that toll circuit of the Automatic Home Telephone Co. extending from Pontiac to Cornell be placed in service and communication over it restored within three days from date of service of order; also ordered that Cornell Telephone Co. and the Automatic Home company enter into an agreement for the use of toll facilities and handling of toll calls between Cornell and Pontiac.

January 3: Rate schedule IPUC 2 of the Mann Telephone Co., for service in Bushnell, canceled; company directed to file schedule ICC 3, effective February 1.

January 3: Rehearing granted on petition of Blandinsville Switchboard Co., of Blandinsville, in the complaint relative to certain practices and charges in that city.

January 3: Supplemental agreement dated September 1, 1922, between Illinois Bell Telephone Co. and the Mann Telephone Co.—which is a modification of an intercorporate agreement approved December 14, 1920, for the exclusion from the toll traffic agreement of the exchange at Camp Point—approved.

January 3: Approval given to supplemental agreement dated October 2, 1922, between Illinois Bell Telephone Co., and the LaHarpe Telephone Co., of LaHarpe, for the exclusion from the toll traffic agreement and toll line supplemental traffic agreement, approved December 14, 1920, of a toll station at Scotsburg and a toll circuit from Scotsburg to a point where it connects with a LaHarpe-Bushnell circuit.

January 3: General order entered approving rules establishing standards of service for telephone utilities in Illinois, designated as General Order No. 107, said rules becoming effective January 15.

January 3: Following cases stricken from the docket, with leave to reinstate: Application of the Chicago Telephone Co. and the Interstate Independent Telephone & Telegraph Co. for an order consenting to and approving purchase by former and sale by latter, of certain property of latter; joint application of Central Union Telephone Co. for authority to buy certain property of the Interstate Independent Telephone & Telegraph Co., and to issue $123,750 par value of notes, and of the Interstate Independent Telephone & Telegraph Co. for authority to sell said property and take, hold and receive $165,000 par value of notes of Central Union Telephone Co.

January 3: Order entered permitting to remain in effect as legal rates for service in Cerro Gordo and LaPlace, rates set forth in schedule IPUC 3 of the Cerro Gordo Telephone Co., and as authorized in provisional order dated October 29, 1920.

January 3: Approval given to lease by C. M. & St. P. Railway Co. to the Illinois Bell Telephone Co. of certain premises in Rockford for a term of three years from November 1, 1922, at a rental of $45 per year.

January 3: ICC rate schedule No. 2, effective February 1, filed by Home Telephone Co., of Arenzville.

January 23: Hearing held at Chicago on citation to Illinois Bell Telephone Co. to show why rates for service in Chicago and vicinity should not be reduced.

January 23: Hearing held at Chicago on citation to Illinois Bell Telephone Co. to show why rates for service in Illinois, outside of Chicago, should not be reduced.

January 24: Hearing held at Chicago on application of Farmers New Era Telephone Co. for rate increase in Hebron and Richmond.

January 24: Hearing held at Chicago on application of Illinois Local Telephone Co. for advanced rates in Lonovan and Iroquois.

Indiana.

January 10: Hearing held on petition of Indiana Bell Telephone Co. to sell its Lewisville exchange to the Knightstown Telephone Co., of Knightstown; sale opposed by Lewisville subscribers; final order withheld pending further negotiations.

Kansas.

January 8: Reduction of 25 cents a month ordered in the residence rates of the Kansas Telephone Co. for service in Ottawa, effective from January 1.

January 13: Order entered approving discount of 10 per cent in the rates of the Kansas Telephone Co. for service at Lawrence; effective only if bills are paid before the 10th of the month following that in which service is rendered.

Louisiana.

January 13: Order entered rejecting reduced rate schedules proposed by Cumberland Bell Telephone & Telegraph Co. and citizens' committee, and entering schedule lower than either of those proposed; effective in Bell exchanges throughout state.

Minnesota.

January 17: Harmony Telephone Exchange Co., of Harmony, permitted to increase its switching rate 15 cents a month, with a discount of 5 cents if paid by March 15 of each year; also authorized to make local rates payable in advance.

Missouri.

January 13: Approval given to sale by L. T. Heaton to C. R. Dickinson and C. C. Dickinson, of the Weaubleau Telephone Exchange, of Weaubleau.

January 15: Albany Telephone Co., of Albany, permited to continue charging present rates.

January 15: Order entered requiring Platte County Telephone Co., of Platte City, to make certain improvements.

January 17: Permission given the Capital Telephone Co., of Jefferson City, to continue charging the present rates on file.

January 17: Tri-County Telephone Co. authorized to reëstablish schedule of rates now in effect at Nelson.

January 17: Home Telephone Co., of Joplin, authorized to continue using present rates in effect at its Webb City exchange.

January 17: In the matter of complaint of the Hume Telephone Co. of Hume, against Pleasanton Telephone Co., of Pleasanton, Kans.; it appearing that agreement has been made between the companies, Pleasanton company granted certificate of authority to operate in Worland.

January 18: In the matter of complaint of the Foster Telephone Co., of Foster, against the Pleasanton Telephone Co., of Pleasanton, Kans.; it appearing that settlement had been made by the companies, approval given to the agreement.

January 18: Order entered resuspending effective date of rate schedule filed by Browning Telephone Co., of Browning, until July 28, 1923.

January 19: Johnson County Home Telephone Co., of Warrensburg, given authority to continue present rates at its Knobnoster exchange.

Nebraska.

January 15: Application filed by the Northwestern Bell Telephone Co. to close its exchange at Lakeside and substitute toll station service. The exchange was opened during the potash excitement in that section of the state, but after Germany got back into the market and forced the closing of the Nebraska plants, the exchange has been reduced to five subscribers, all of whom sign the petition.

January 16: Application filed by Indian Creek Telephone Co. of Red Cloud for validation of rates mistakenly made without authority from the commission.

January 17: In the matter of the application of the Platte Valley Telephone Co. for joint-user rates; ordered that company be authorized to charge $1.50 a month at Scottsbluff exchange, and $1 a month at exchanges at Morrill, Mitchell, Gering, Bayard and Minatare.

January 17: In the matter of the application of the Scotia Telephone Co. for permission to make joint-user rates; found that rate asked for is in excess of the standard, and denied, but rate fixed at $1 a month, to include directory listing.

January 17: In the matter of the application of the Wehn Telephone Co. for permission to charge joint-user rate; ordered that a rate of $1 a month be granted for exchanges at Broadwater, Lisco, Oshkosh and Lewellen.

January 18: Complaint filed by John S. Weiss, of Hamlet, against Palisade Telephone Co. alleging insufficient telephone service.

January 19: By unanimous action of the commission, H. G. Taylor was re-elected chairman and John E. Curtiss secretary.

Ohio.

January 23: Hearing held on application of the Ohio Bell Telephone Co. for authority to unify the service at Westerville.

Oklahoma.

January 8: Order issued reducing charges for telephone removals, prohibiting charges for changing numbers and listing in classified directories, and establishing other rules; effective throughout state.

Pennsylvania.

January 11: In the matter of complaint of Friends Cove Telephone Co. against Bedford County Telephone Co., of Bedford, alleging that switching rate of $6 per year is unreasonable; held that the rate is justified.

Wisconsin.

January 13: Permission granted Mount Vernon Telephone Co., of Mount Vernon, to place in effect the increased rate schedule allowed March 9, 1922.

Sundry Snapshots Along the Trail

Observations and Comments, Pertinent and Otherwise, On the Sunshine and Shadows of Telephone Work

By Well Clay

When memory takes me by the hand
And leads me through the haze,
Which glamours o'er that fairy land
Of half-forgotten yesterdays.

We wander back to that home cot
Once of such stupendous size,
Where on baking days I used to watch
My mother making pies.

How deftly did she roll the dough
With which to line each tin,
Or swiftly measure spicy stuff
And slice crisp greenings in.

Her dear old hands so seamed and worn,
Now long since back to dust,
How sure when they would wield the knife
To trace the patterns in the crust.

There always were a few scraps left
When the grown up pies were done,
From which turnovers could be made
Just right for little son.

'Tis many years since those old days,
Still I can shut my eyes,
And bring to mind that soulful scent;
The smell of mother's pies.

From out the oven piping hot,
With rich juices running o'er,
So crisp and brown, so thick and sweet
Their like I'll see no more.

In order that we should be able to properly appreciate mother's pies, if we could get them once again, we would have to have the same old healthy appetite we had when they were on tap. Our appetites have changed with added years and we might find our tastes changed somewhat. So in our business lives.

So many new things have entered in to change and affect the original viewpoint that we can scarce recognize one familiar landmark which we decided to be a fixture when we first took up our duties along the lines of furnishing telephone service.

The Patron Pays a Higher Price and Has Been Known to Sigh for the Good Old Days of Service.

From an outstanding and novel bit of adventure, it has dwindled back and become a part of every-day business scenery as one of the standardized professions, no longer novel and looked upon as a source of entertainment and wonder but merely now a matter of merchandising—to furnish a recognized necessity in a suitable manner at a profit. However, that may mean a good deal.

It may require considerable ability along specific lines and as much application as many other lines of merchandising, generally considered much more complicated and portentous. Successful merchandising of telephone service can not be carried on in many of the ways which are adapted and recognized as proper in other lines of merchandising.

In dry goods or general merchandise, hardware, sporting goods, haberdashery and many other lines, one can buy from the little country store near his rural home, from the peddler who goes about the country hawking his wares, from the small-town merchant, from the metropolitan stores, or by means of a mail-order catalog. In all these lines he can be served in a reasonably efficient, economical and satisfactory manner.

In the merchandising of telephone service, one must depend on only one source of supply—his nearest exchange. To the operator who answers his call from his home, store or office, must he go for everything in the line of telephone service. To and through the local exchange operator, he must express his wishes and get his returns—there is no other way.

Whether the patron lives in a crowded Harlem flat, in a big metropolitan hotel, or on a lonely ranch far from the busy towns, to the operator who answers his call must he go for all which he would receive in that line. The service cannot be sold by mail, cannot be stored up in quantity against a future withdrawal, cannot be bought in quantity, but must ever be doled out in small quantities to individual needs on the instant.

Like the air we breathe in a way is telephone service. Service is personal, necessary at all times, and only needful in small amounts. It must be good at all times and always ready for instant use. That is the natural need of telephone service. That is the satisfactory kind to render patrons. That is the only kind which will keep users satisfied or telephone merchandisers feeling that they are filling the bill as it should be taken care of.

Questions of rates should be only secondary as matters of grave concern. If service can be given, rates can be made to take care of all the various necessary drains. On the principle that the efficient cook has little need to worry about her wages, the efficient telephone organization need not be primarily concerned about its ability to collect a proper charge, if it first renders proper service.

Good Cooks Get Good Money These Days and the Efficient Cook Need Not Worry About Her Wages.

The producers of telephone service are in a class all by themselves in the public utility field. While the railroads carry millions of passengers a year and render on the whole satisfactory, yes, even remarkable service, the telephone renders service not only daily but hourly to many times the number of passengers carried by the railroads.

The service is more personal also in that the telephone user comes in direct contact with the servants of the corporation or association rendering the service more closely than they do with the servants or representatives of any other utility. The possibilities of interweaving the service into the daily fabric of their lives in infinitely greater than and different from any other utility catering to them.

The turning on of an electric lamp brings a service, but it is purely a mechanical one, in the minds of the user. It carries with it no imaginative picture of any personal or human agency.

With the telephone call, outside the automatic service, a call to Central brings the user into speech with the party from whom service, in the way of making connection, is expected and with the party wanted, when the connection is finally completed—all a personal experience. The mind visualizes some sort of a person as

the one to whom his request is made and, of course, with the party called.

It is a personal experience all through, for the majority of telephone calls in the world.

What I wish to get over is the fact that most of the telephone service in the rural regions and small towns in this country is still handled in a purely personal way by real human beings instead of machinery. As long as this is the case, just so long will telephone service be personal service. It will continue to be handled retail at first hand and will be handled more cheaply and satisfactorily by the smaller home-financed and managed companies than by large aggregations of capital directing huge and highly-specialized forces of employes.

Where the large companies have taken over the little units of distribution far removed from headquarters, the subsequent experience has been usually that the patron pays a higher price and in some instances has been known to sigh for the good old days of service furnished by the Home company. Like the good old apple pies of mother's time, the lack was only realized when no longer attainable.

The big drawback in highly specialized and wholesale direction from distant points is that as each and every angle of service is worked out and the best method found, or supposed to be, that part of the service, is, so to speak, slipped into a rut where it is supposed to stay.

That circumstances may alter cases and geographical location change the aspect of any kind of service does not always enter into the calculations of those giving the orders. The little unit is self-governing to a large extent and, like the family flivver, can turn around in its own length, whereas, the million-dollar train must stay on its appointed track for safety's sake.

Reversing a traffic order or an operating rule is a stupendous thing in all its ramifications with a big company, whereas with a little cross-roads exchange it means but little in the way of effort. Both can get into pretty deep ruts, however, and that is the main thing to guard against, not the worry of whether you can collect a remunerative rate if you give good service. The field is still yours. Cultivate it intelligently.

APHORISM: Many a rut imprisons a "nut."

Personal and Biographical Notes

H. C. Johnson, of Lawrenceville, Ill., has been named as manager of the Citizens Telephone Co. of Lawrence County, to succeed James Hardacre, resigned.

Mr. Johnson has had a wide experience in dealing with the public, having been county clerk, deputy sheriff, and postmaster of Lawrenceville — holding the latter position for eight years. About a year ago he became manager of the ice and cold storage plant, which position he will continue to hold in addition to his performing his duties as manager of the telephone company.

O. L. Fink, who has purchased and taken active management of the Clarendon Telephone Co., Clarendon, Texas, has a good knowledge of how to manage a telephone exchange.

For the past five years he has been engaged in the telephone business at Wellington, Texas. He was manager of the exchange at Willis Point for 10 years and was associated with his brother in the management of the Mexia exchange for a number of years.

T. L. Benedict, who was manager of the Clarendon Telephone Co., Clarendon, Texas, until January 1—when the partnership of Mr. Benedict, Dr. Wm. Gray and W. H. Patrick sold the company to O. L. Fink, of Wellington—has retired from the telephone business and gone to Southern Texas for his health.

Mr. Benedict is one of the oldest telephone men in the United States, having been actively engaged in the business since 1881, and is one of the 25 oldest members of the Telephone Pioneers of America. He has been a faithful and efficient worker in Independent association affairs, as well as an active participant in aiding the progress of the telephonic art.

He took up the problems of toll work when they were the most difficult. In 1881, with a few other men, he purchased an abandoned telegraph line between Marshall and Jefferson, Texas, and made it over into a toll circuit.

Under his administration, the Clarendon exchange—which has extended over a

T. L. Benedict, Pioneer Texas Independent Telephone Man, Has Disposed of His Interests in Clarendon Telephone Co. and Retired.

period of 18 years—has been enlarged several times to take care of the growing list of subscribers and has built up a service of exceptional quality. The company moved into its present home—which is of the most modern type—two years ago.

The city of Clarendon has taken pride in leading other United States' exchanges in the number of telephones per capita. A few years ago it was one telephone to every five persons; now it is one to every three—950 to a population of about 2,700.

Mr. Benedict has generously given the operating staff much of the credit for the good standing of the company in the community, but it has really been due to the unity existing between the management and the employes.

In addition to being an Independent Pioneer, Mr. Benedict is a Mason and a charter member of the Delta Chi fraternity of Cornell.

A. U. Mayfield, of Denver, Colo., editor of the "Monitor," the employes' publication of the Mountain States Telephone & Telegraph Co., has been elected president of the advertising bureau of the Denver Civic & Commercial Association.

Obituary.

Walter F. Brown, general traffic manager of the Mountain States Telephone & Telegraph Co., with headquarters at Denver, Colo., died on January 17 of double pneumonia, which had developed from a severe cold.

On Monday evening, January 8, Mr. Brown acted as toastmaster at the banquet of the Telephone Pioneers of America, at which time he had a slight cold—it proving serious a few days later.

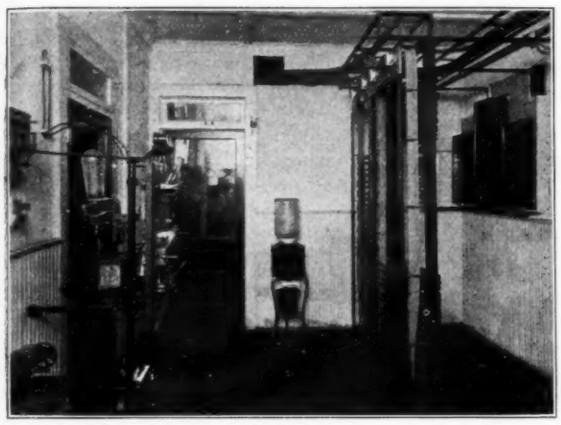
He was born in New London, Conn., on March 28, 1873, and graduated from Yale in 1893. Starting at the bottom in the telephone industry, Mr. Brown rose step by step, learning all the details which constitute the working of a telephone business.

Well known to both Bell and Independent men, he was liked by all who knew him, and was held in high esteem for his knowledge of telephony. The Mountain States' organization suffers a great loss in his death for he had been a good worker and had done much to advance the company's interests.

Continually Improving Service Pays

How the Dan River Telephone Co., of Turbeville, Va., Increased Its Subscribers from 441 to 600 in a Year—Continuously Bettering the Service Made Satisfied Patrons and Brought the Company a Higher Rate Schedule

The Dan River Telephone Co. was organized May 21, 1903, at Turbeville, Va., with A. E. Wilkins as president and Dr. J. A. Owen as secretary and treasurer. They had one grounded line from Turbeville to South Boston, which had eight Sumter telephones. This line was constructed and the telephones installed by Charles V. Brookes, the present secretary and treasurer of the company.



On July 1, the Dan River Telephone Co. purchased the South Boston Telephone Co., which had 108 stations operating in the town of South Boston, and also the Cluster Springs Telephone Co., which was operating five rural stations.

The Dan River Telephone Co. was then reorganized with A. E. Wilkins as president, Charles V. Brookes, secretary and treasurer, and Rufus Owen as vice-president and general manager.

On March 27, 1907, the main office of the company was burned with a total loss excepting the board and main frame. This suspended the service until the following June, at which time it was resumed with 142 stations.

The company suffered the loss of President Wilkins in 1910. He was succeeded by Rufus Owen, who is still efficiently serving the company in the same capacity.

Having had a great growth since its organization, the directors decided to own their own building and on September 1, 1921, moved their office into their own building on upper Main street. At that time they cut over from their old visual type magneto to the latest Kellogg service board.

At the time of this installation the company had 441 stations and with its new service the number of subscribers has increased to almost 600. The service is splendid, averaging between two and three seconds on answering time. In fact, the service was so unusually good that the city council and the Young Men's Business Club signed a petition to the Virginia Corporation Commission asking that a rate of $4.50 business, and $3 for residence, as against the old rates of $3 and $2, be granted. This was granted and the companies were allowed to charge 50 cents a month additional for desk sets.

This Modern Switchboard Is Part of the New Equipment Which Enabled the Dan River Company to Give Such Good Service That Its Rates Were Raised.

South Boston is a pretty little town and second largest loose-leaf tobacco market in the Piedmont belt, selling in 1920 32 million pounds of bright tobacco. The Imperial Tobacco Co. has one of the largest tobacco plants in America there, with others nearly as large. There are also cotton mills, wagon works and a large bottling plant. Paved streets and many beautiful homes make South Boston a desirable place to live in, and it might be mentioned that it rivals Portland, Ore., for pretty rose bushes.

Left: Neatly Arranged Terminal Room.

Right: The Office of President and General Manager Rufus Owen.

E. J. Strickland, who has been plant wire chief since April, 1905, has developed one of the most modern and best equipped plants in the state.

Small Mileage Increase in 1922, But Good Increase in Value.

There has been only a slight increase in the mileage of telephone lines operating within the state of South Dakota within the past year, according to the annual report of the state tax commission. The number of miles shown in the report of 1921 totaled 39,490.54 while the 1922 report shows a total of 39,694.48 miles.

However, there has been a considerable increase in the total valuation. In the 1921 report the total valuation of lines within and without corporate limits amounted to $5,991,877, while the 1922 report values the lines within and without corporate limits, at $6,081,453, an increase of $89,576. The number of companies operating within the state in both years was approximately 666.

In the 1922 report the value of lines outside of the corporate limits of towns and cities amounted to $3,007,448 and the value of those within corporate limits totaled $3,074,005. The 1921 report shows those outside corporate limits valued at $3,028,616 and those within at $2,963,216.

From Factory and Salesroom

Conventions: Nebraska, Lincoln, February 20-22; Kansas, Ottawa, March 6-8; Oklahoma, Oklahoma City, March 12-14; Texas, Dallas, March 20-23

Telephone Switchboard Plugs With "Long Wear" Features."

A telephone switchboard plug that has proved itself effective and is claiming the attention of telephone men in many countries is the "Automatic" plug designed and perfected by M. B. Richter and manufactured by Telefon Fabrik Automatic, Copenhagen, Denmark.

The noteworthy point about the automatic plug, and that which has won for it the favorable comment of telephone experts, is its solidity and mechanical strength. This is accomplished by the method of construction, which was carefully worked out by Mr. Richter. The feature of the method is that the insulation is pressed into the plug while the parts are held firmly in their proper positions.

For pressing the material to be insulated, the parts are assembled and enclosed in a mold. The operation takes place in a specially constructed air press, exerting a pressure of about 7,250 pounds to the square inch, which is continued until the mold is cool. The insulating material—consisting of one part only—is heated until it becomes plastic, and is then pressed through a tiny aperture into the interior of the plug. A distance piece is used to maintain the various conductors in their relative positions during the operation.

The result is that the conductors and insulating material are welded into one piece, possessing a stability closely approaching that of solid metal.

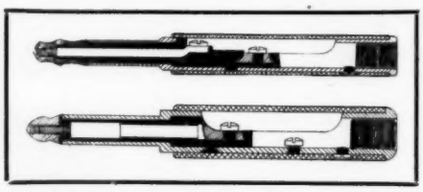
The profiling of the plug is done by means which insure precision—the tolerance worked to being 0.003 of a millimeter, which is equivalent to 0.0012 of an inch.

The effect of the method of insulation developed by Mr. Richter is to make the parts unable to change their predetermined positions—being, as it were, welded together in the insulating material and bringing about a permanent insulation.

The process has proved eminently successful, it is declared. Any kind of plug may be manufactured by this method, and Telefon Fabrik Automatic has made about 80 different types of two, three and four-conductor plugs. They are used in practically every European country and many of the other countries of the world.

The war and its aftermath prevented this company from bringing its product to the attention of the American countries, but it is now beginning to acquire a name for itself among the engineers on this side of the globe.

The company has been established for over 30 years and has made plugs by the patented method for the last 10 years or so. This 10 years of specialization has developed, among the many other varieties of merit, the two and three-conductor telephone switchboard plugs, of which sections are shown in the illustration. An examination of a section of a real plug similar to the illustrated section shows the parts to be welded into a perfect unit—although it can be plainly seen that each part is carefully insulated and distinct from every other part.



Cross-Sections of Plugs Manufactured by Denmark Company and Meeting With Favor.

In designing the construction of the automatic plug, it was the intention to do away with repairing in order that there might be no change in the form of the plug during its life, and this, it is stated by users, has been accomplished. And its life is not shortened by that fact—rather, it is lengthened.

The method developed by Mr. Richter is stated to secure a very accurate and solid construction, because of the close cohesion of the conductors preventing loosening, owing to the insulation being in one piece.

The Telefon Fabrik Automatic has supplied the new process plugs to the Copenhagen Telephone Co.'s exchanges on Seeland Denmark — accommodating more than 100,000 subscribers—for the last 10 years, and the company now uses that product exclusively. The engineer-in-chief of the Copenhagen system expresses complete satisfaction with the plugs.

A high compliment was paid the Telefon Fabrik Automatic by the Royal Administration of Swedish Telegraphs, when it transmitted to the company a statement received from Klas Weman, chief of the government factory at Nynashamn—who is also well known in the United States as a telephone expert, and whose statement the administration was pleased to make its own.

Mr. Weman reported that he had purchased a large lot of the plugs for the administration, had submitted them to careful tests and given them considerable study. He found them to be of an exceptionally high grade type, particularly as regards insulation and mechanical construction. The simple and reliable method of manufacture, he stated, gave the finished plugs a solidity unattainable by other methods of construction.

The company is also in possesion of acknowledgments of the governments of Switzerland and The Netherlands, reporting complete satisfaction with the plugs. They have also been tried out in England, good reports rendered, and repeat orders—the very best recommendation—issued.

Sample sections of the plugs will be sent to all interested telephone companies upon request to Telefon Fabrik Automatic, Amaliegade 7, Copenhagen, Denmark.

Leich Three-Position Multiple Magneto Board at Ligonier, Ind.

H. E. Inks of the Ligonier Telephone Co., Ligonier, Ind., gave his subscribers a rare Christmas gift by placing an order with the Leich Electric Co. for a three-position magneto multiple switchboard. The subscribers will get the benefit of the improved service very soon after the board is delivered, for no change will be necessary in any of the racks, and the board is completely assembled in the factory.

The installation will require only a few days and the cut-over will be made without interruption in service.

The new magneto multiple switchboard has an ultimate capacity of 600 lines, with present equipment for 430 lines. The jacks are fully multipled in each four panels and the line signals restore from jack in any position when a call is answered. The call distribution is very good, as each operator is able to answer calls originating in any position, thus not allowing calls coming in on a busy position to be delayed. No doubt the subscribers will think theirs was the only call on the board so quickly will they hear the operator's "Number, please?"

Making Study of Bell and Independent Exchanges.

J. K. Johnston, telephone engineer, of Indianapolis, is making an examination of some 60 exchanges of the Indiana Bell Telephone Co. in Indiana and also a number of Independent exchanges in the Middle West. The study of the latter ex-

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Furnishing absolute protection at cost.

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Returning savings at the end of the policy period, depending upon the individual experience of the risk.

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It is an honest policy, carried out in an honest way and gives a square deal under all conditions.

This forms the creed of every member of the organization and has built up the reputation of Lynton T. Block & Co. until it is one of the best and most favorably known in the Mississippi Valley.

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"INSULATE"

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MOUTH PIECES
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GENERAL INSULATE CO.

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Established 1905
AGENTS
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Please tell the Advertiser you saw his Advertisement in TELEPHONY.

changes is for the purpose of comparing the equipment and traffic with that of the Bell company.

The work is being done to supply information for the Indiana commission in connection with its investigation of the operations of the Indiana Bell company.

Data on Telephone Wire Compiled by Copper Clad Steel Co.

Of interest to all telephone managers and construction men are the technical data sheet and wire tables on Copperweld telephone wire, which have been prepared by the Copper Clad Steel Co., of Rankin, Pa.

The data compiled shows the relative values of different kinds, and gauges of wire—dealing with weight per mile, breaking strain, resistance, speech transmission characteristics and such other points as go toward keeping down the maintenance costs. The per mile weight data present an interesting comparison. It is stated that the quality of transmission over Copperweld wire is practically the same as that received over a solid copper wire and better than that obtained over galvanized wire, because of the smaller attenuation of the voice currents. A table of speech transmission equivalents is given to show the transmission qualities of Copperweld wire.

As an example of the strength and lasting qualities of Copperweld wire, it is cited that it can be taken down and restrung many times without injury or loss of conductivity. Sag and tension charts have been compiled by the company and may be obtained upon request.

The many good features of the No. 17 Copperweld twisted pair wire—which is a rubber covered drop wire—are also explained on the data sheet.

Copperweld ground rods are another product of interest to telephone men. They are recommended by the manufacturer for localities where galvanized ground rods or pipes rust away.

A word about the basic principle of Copperweld wire might be apropos. It is made by the molten welding process—which means that the pure copper exterior is permanently welded to the steel core. This process, it is claimed, prevents the wire from cracking or flaking when it is bent or twisted, and eliminates galvanic action.

The Copper Clad Steel Co., Rankin, Pa., will be pleased to furnish, to those requesting it, complete information regarding its products and the advantages of buying wire on a cost per mile basis.

Changes in the Western Electric Organization.

The Western Electric Co. has announced important organization changes which were effective January 15.

F. A. Ketcham has been appointed general manager of the supply department. For the past four years Mr. Ketcham has been general sales manager.

G. E. Cullinan assumes the position of general sales manager. Mr. Cullinan entered the employ of the company upon his graduation from Williams College in 1901 and for several years was connected with the New York house. He went to St. Louis in 1907 and was manager there from 1909 to 1918, when he went to Chicago as central district manager.

L. M. Dunn, who for the past three years has been manager of the eastern district, which includes the New York and the New England territory, has been appointed general merchandise manager on the general manager's staff.

W. J. Drury has been made manager of the eastern district to fill the vacancy created by Mr. Dunn's advancement. Mr. Drury has been sales manager of the New York house for the past three years, and is succeeded in that capacity by J. F. Davis, who has been sales manager of the Boston branch for the same period.

G. E. Cullinan, New General Sales Manager of the Western Electric, Has Served the Company in Many Capacities.

T. E. Burger has been made sales manager at Boston. Mr. Burger was for 13 years connected with the Los Angeles and San Francisco organizations, being sales manager of the former. More recently he has been on the staff of the Society for Electrical Development, going back to the Western Electric organization in 1922.

W. P. Hoagland has been appointed central district manager in charge of the Chicago and Minneapolis branch houses. For the past three years Mr. Hoagland has been sales manager at Chicago.

J. H. Gleason takes the position of Chicago sales manager. Mr. Gleason has been power apparatus sales manager at Chicago.

H. L. Grant, who for the past three years has been general appliance sales manager, located at New York, has been appointed Erie district manager, a new grouping of the distributing houses at Cleveland, Pittsburgh, Detroit and Cincinnati. Mr. Grant's headquarters will be at Cleveland. A. M. Collins continues as manager of the Cleveland house.

It is interesting to note that all of these organization changes are promotions. This is in line with the Western Electric Co.'s consistent policy of advancing men who have made good in previous capacities.

Paragraphs.

THE STANDARD UNDERGROUND CABLE Co.'s Boston office, of which F. C. Cosby is manager, has been moved from the Delta Building to 609-612 Unity Building, 185 Devonshire street, Boston, Mass.

THE GENERAL INSULATE Co., Brooklyn, N. Y., the well-known moulders of Insulate and also of Hy-Heet parts for the radio and electrical trades, as well as for a score or more of the mechanical trades, reports for the year just passed that its volume of business has increased more than 100 per cent over 1921, 1922 being the second largest year in volume of sales and net results since the General Insulate Co. was established nearly 20 years ago.

In addition to the well-known products of Insulate (black shellac composition) and Hi-Heet (phenol composition) the company has shown for the first time at the radio show which has just closed in New York, an entirely new product—star insulate—a material that has great mechanical and dielectric strength, resiliency and can be moulded to almost any shape, either thick or thin, and any color, opaque or translucent.

WILLIAM J. HAGENAH, of the firm of Hagenah & Erickson, public utility engineers, Chicago, who, with a staff of engineers and accountants has been engaged on public utility investigation work in South America, has returned to the United States.

The work in question, which covered gas, tramway, telephone, and electric light and power properties, extended over a period of one year, and was undertaken for foreign banking interests.

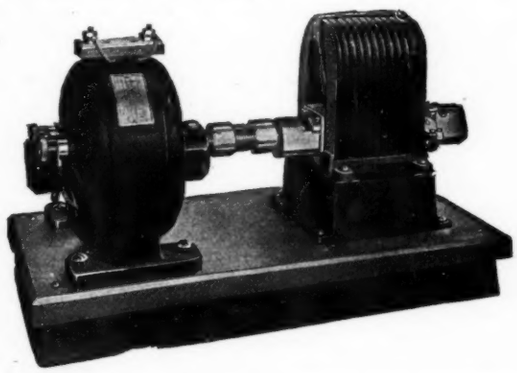
Get a Telephone in Japan? Pay Big Bonus.

Owing to lack of equipment, the government in Japan depending upon Japanese companies to supply it and refusing to import, a telephone is a luxury in Japan, only to be obtained by long waiting or the payment of exorbitant prices.

Brokers have established businesses all over the country to deal in telephones, buying those that customers no longer want, getting others from the government departments and selling them at high prices. A number of these brokers have been found guilty in the preliminary courts of bribing officials and charging subscribers large sums of money to have instruments installed.

Have You Uniform Ringing Current?

It's up to you to provide it in your exchange. The Holtzer-Cabot Magneto-Ringing Motor-Generator gives it 24 hours a day—and whenever needed. The machine operates from the lighting circuit, independent of any battery.



There is constant frequency and constant voltage—and absolutely uniform ringing service. Don't YOU need it?

THE HOLTZER-CABOT ELECTRIC COMPANY

Boston Philadelphia Detroit New York
Chicago Minneapolis Baltimore Cleveland

Reliable Grounds

are obtained with

"COPPERWELD"

TRADE MARK REG. U.S. PAT. OFF.

GROUND RODS

(Made by the Molten Welding Process)

THEY DO NOT RUST AWAY

Ideal for all earth grounding

NO RUSTING—because of the thick welded copper exterior.
NO BENDING—the stiff steel core prevents bending.
ONE PIECE—no fittings required.
EASY SOLDERING—connection of ground wire and rod is easily and permanently made.

Rusted high resistance grounds are a liability.

Specify COPPERWELD Ground Rods

Copperweld Wire Tables and Technical Data SENT ON REQUEST

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Higher Voltage
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Does tradition stand in your way?

Are you hesitating about trying a battery other than what you have been using just because you've always used that battery?

If you can save your company many hundreds of dollars by employing a telephone battery that costs less per cell and less per day's service, isn't it worth investigating?

Would it interest you to know that 1922 brought about a change among telephone companies whereby 15% of the industry "swung over" to VICTOR TELEPHONE CELLS? As one purchasing agent wrote:

"We must give the devil his dues. Frankly, we never thought you had such a remarkable product, but count on us as a steady user as long as you demonstrate such quality and low price combined."

What will be your battery cost in 1923? What will be your battery economy in 1923?

Say it with

VICTOR TELEPHONE CELLS

Write for Price List and complete information regarding trial barrel.

The CARBON PRODUCTS COMPANY

LANCASTER, OHIO

Record of Telephone Patents

1,438,758. December 12, 1922; filed February 24, 1919. MACHINE SWITCHING DEVICE; six claims; C. L. Goodrum, New York City; assigned to Western Electric Co. A step-by-step register device is responsive to impulses from a subscriber's impulse sending mechanism. A driving circuit for a power-driven selector switch is established at each step of the register device. Correct positioning of the switch is insured at any relative speed of operation of the step-by-step device.

1,438,841. December 12, 1922; filed September 6, 1919. TELEPHONE EXCHANGE SYSTEM; 13 claims; A. E. Lundell and E. H. Clark, New York City; assigned to Western Electric Co. Telephone lines terminate in groups of fixed contacts of an automatic switch, which is moved back and forth over the contacts of a group. Means, responsive to the electrical condition of intermediate contacts, determine whether the back-and-forth movement is to extend over one or a plurality of the groups.

1,438,938. December 19, 1922; filed March 29, 1920. TRANSMISSION SYSTEM; four claims; J. F. Baldwin, Jr., East Orange, N. Y.; assigned to Western Electric Co. A common housing for loading coils is described, in which two of the loading coils are separated from each other a distance less than the width of one of them. Means are placed between the two loading coils for substantially eliminating the electrostatic field therebetween.

1,438,994. December 19, 1922; filed July 24, 1919. ELECTRIC REGULATOR; 66 claims; R. D. Conway, Chatham, N. J.; assigned to Western Electric Co. This regulator comprising a solenoid, has means for automatically changing its calibration an amount dependent upon the intensity of the energizing force supplied to the solenoid. The means comprise impedance elements in series with the solenoid and movable contacts individual to the elements controlled by the solenoid.

1,438,945. December 19, 1922; filed July 24, 1919. ELECTRIC REGULATOR; 19 claims; R. D. Conway, Chatham, N. J.; assigned to Western Electric Co. In this solenoid, relays are individual to the resistance elements for controlling the elements, while an interrupter places the relays under the control of the solenoid.

1,438,946. December 19, 1922; filed December 8, 1919. ELECTRIC REGULATOR; 28 claims; R. D. Conway, Chatham, N. J.; assigned to Western Electric Co. In this system, a solenoid is responsive to a condition of a work circuit. Means responsive to the solenoid increase the value of a variable impedance, and other means decrease the value.

1,438,947. December 19, 1922; filed December 9, 1919. ELECTRIC REGULATOR; 18 claims; R. D. Conway, Chatham, N. J.; assigned to Western Electric Co. A variable resistance is provided for each of the work circuits and a solenoid, responsive to a condition of only one of the circuits, controls the amount of resistance in each of the work circuits.

1,438,953. December 19, 1922; filed July 12, 1919. LIGHTNING ARRESTER; eight claims; G. R. Folds, Evanston, Ill.; assigned to Cook Electric Co., Chicago. Line springs and a ground plate are placed in juxtaposition, the springs being severally adapted to be mechanically interconnected but electrically separated from the plate by a pair of conducting blocks separated by a dielectric. Means for mechanically connecting and electrically separating each of the springs and plate, comprise a conducting plate with a serrated electric discharge edge. The conducting plate is adapted for interchangeable insertion with one of the conducting blocks that may be received between each of the springs and plate.

Printed copies of patents may be secured by addressing the Commissioner of Patents, Washington, D. C., enclosing 10 cents for each copy.

1,438,954. December 19, 1922; filed November 12, 1919. LIGHTNING ARRESTER; seven claims; G. R. Folds, Evanston, Ill.; assigned to Cook Electric Co., Chicago. An assembled integral unit electrically separating line and ground members includes conducting members separated by a dielectric. The conducting members are mechanically connected to each other through a dove-tail joint, the tenon and mortise of which are electrically separated by the dielectric. Other means are provided which form an electric discharge path between the conducting members.

1,438,959. December 19, 1922; filed August 29, 1904. AUTOMATIC TELEPHONE EXCHANGE SYSTEM; 19 claims; J. W. Lattig, Bethlehem, Pa., and C. L. Goodrum, New York City, N. Y.; assigned to Western Electric Co. Automatic switching apparatus normally at rest extends a connection from a calling to a called line. Talking current is supplied through only two relay windings to the substation of the calling subscriber. The same kind of current is also supplied through only two relay windings to the substation of the called subscriber, none of relays being individual to the called subscriber.

1,438,960. December 19, 1922; filed August 29, 1904. AUTOMATIC TELEPHONE EXCHANGE SYSTEM; 23 claims; J. W. Lattig, Bethlehem, Pa., and C. L. Goodrum, New York City, N. Y.; assigned to Western Electric Co. Electromagnetic call charging means are provided for the subscribers' lines and means, automatically operated by the completion of an inter-office connection, supply current to the inter-office trunk of two conductors only, to cause the operation of the charging means.

1,438,974. December 19, 1922; filed November 13, 1920. PIEZO-ELECTRICAL VOLTAGE INDICATOR; five claims; E. C. Wente, New York City, N. Y.; assigned to Western Electric Co. In this device for indicating the intensity of an electric current, a number of piezo-electric crystalline blades are rigidly supported at one end. A reflector is supported by the free ends of the blades, which are laterally supported.

1,438,976. December 19, 1922; filed June 8, 1918. ELECTRIC REGULATOR; 22 claims; P. I. Wold, East Orange, N. J.; assigned to Western Electric Co. The anode and cathode of a vacuum tube are connected in circuit with an electric machine, whereby the tube is supplied with space current from machine's supply leads. A connection from the leads to a control electrode varies the potential of the control electrode in response to changes in the current of the supply leads to control a condition of the machine.

1,438,987. December 19, 1922; filed September 30, 1919. HIGH-FREQUENCY TRANSLATING CIRCUITS; nine claims; L. Espenschied, Hollis, N. Y., and H. A. Affel, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co., New York City, N. Y. In this high frequency signaling system a translating device is combined with a plurality of circuits constituting respectively sources of carrier current and of signaling current. Each of the circuits has a filter associated therewith to prevent mutual reaction between the respective input circuits.

1,438,988. December 19, 1922; filed September 30, 1919. HIGH FREQUENCY TRANSLATING CIRCUITS; seven claims; L. Espenschied, Hollis, N. Y., and H. A. Affel, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co., New York City, N. Y. An antenna of a magnetic translating device comprising a plurality of input circuits, each characterized by a source of current of a definite frequency, is combined with a filter adapted to transmit the frequency.

1,438,989. December 19, 1922; filed September 30, 1919. HIGH-FREQUENCY TRANSLATING CIRCUITS; seven claims; L. Espenschied, Hollis, N. Y., and H. A. Affel, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co. In this high-frequency signaling system is presented the combination of an antenna of an oscillatory arc circuit, a low-frequency input circuit characterized by a source of low-frequency variations and a filter adapted to transmit the variations, but not the oscillations set up by the arc.

1,439,036. December 19, 1922; filed July 10, 1920. VOLTAGE REGULATING CIRCUIT; seven claims; S. Suekoff, Chicago; assigned to Kellogg Switchboard & Supply Co. This voltage regulator comprises a sensitive circuit closer, a pair of relays comprising a double-wound relay and a shunting relay operatively associated therewith, the double-wound relay controlling the circuit of the shunting relay, a pair of bus bars, a storage battery connected across them, and means controlled by the relays in association with the circuit closer for maintaining the potential across the bus bars within certain limits.

1,439,071. December 19, 1922; filed March 20, 1915. SECRET SERVICE CORD CIRCUIT; 50 claims; H. D. Currier, Chicago; assigned to Kellogg Switchboard & Supply Co. Substation controlled means operatively disassociate the cord circuit from the subscriber's line, and operate a supervisory signal individual to the cord circuit to denote a recall.

1,439,117. December 19, 1922; filed August 16, 1915. TELEPHONE INSTRUMENT; eight claims; J. S. Newman, Cleveland, Ohio. In this telephone transmitter a pair of freely-suspended and independently-vibratory electrodes is connected to the diaphragm. The granular conducting material is placed between the electrodes, which are formed on complementary curved surfaces.

1,439,124. December 19, 1922; filed February 14, 1916. AUTOMATIC TELEPHONE SYSTEM; 95 claims; R. G. Richardson, Chicago; assigned to Automatic Electric Co. Link circuits each comprise a pair of talking conductors and a finder switch is provided for each link for connecting a calling line of a group thereto. A pair of normally-closed contact members in each of the finder switches is individual to each of the lines.

1,430,134. December 19, 1922; filed April 7, 1919. MODULATING METHOD AND SYSTEM; 12 claims; L. J. Sivian, East Orange, N. J.; assigned to Western Electric Co. A method is described for producing a wave modulated in amplitude in accordance with a lower frequency wave by an electron discharge device having an input circuit and an output circuit coupled thereto through an oscillatory circuit. It comprises changing the effective coupling between the oscillatory circuit and the input circuit in accordance with the wave of lower frequency for the purpose of varying the instantaneous value of the energy of the output circuit.

1,439,213. December 19, 1922; filed April 24, 1919. TELEPHONE EXCHANGE SYSTEM; 23 claims; S. B. Williams, Jr., Brooklyn, N. Y.; assigned to Western Electric Co. In this exchange system of calling and called subscribers' lines, another line for extending the calling line has associated with it means for selecting an impulse-controlling mechanism whereby certain of the counting relays are energized, and means directly responsive to the energization of the counting relays extend the calling subscriber's line to the subscriber's line.

1,439,427. December 19, 1922; filed July 19, 1917. AUTOMATIC TELEPHONE EXCHANGE; 23 claims; F. A. Lundquist, Chicago; assigned by mesne assignments to H. S. Conrad, trustee. In this trunking electric device, a wiper carrier is operated pneumatically to extend connections to idle trunk lines. A master device, operated electrically to a position always in alignment with an idle trunk, controls means for stopping the contact carried opposite the trunk when the contact carrier is operated.

1,439,723. December 26, 1922; filed September 17, 1918. NUMBERING SYSTEM FOR AUTOMATIC TELEPHONE EXCHANGES; 12 claims; W. G. Blauvelt, New York City, N. Y.; assigned to American Telephone & Telegraph Co. A method of dialing in a mechanical switching system in which subscribers are designated by a combination of office names and numbers is described. It consists in assigning names to the offices of the system, each having a characteristic letter which is different for each office and dialing the letter of the office name which is suggestive thereof to establish a connection to a desired office. The digits of the number of the subscriber's designation are then dialed successively to establish a connection to a subscriber in the office.

1,439,729. December 26, 1922; filed September 7, 1922. TELEPHONE HAND SET; six claims; G. Deakin, Antwerp, Belgium; assigned to Western Electric Co. A calling dial is detachably mounted on the connection stem between the receiver and the transmitter. The operating circuit is closed at all times and kept closed through the dial when, and only when, the latter is attached to the stem.

1,439,735. December 26, 1922; filed October 20, 1920. TELEPHONE EXCHANGE SYSTEM; 40 claims; E. W. Hancock, New York City, N. Y.; assigned to Western Electric Co. In this machine switching system, automatic switches extend the telephone connections. Impulse means set a variably operable register, which control means for positioning a variably operative selective switch. Means rendered effective by the selective switch, while in its set position, determine the operation of a sender mechanism in accordance with such position, and means controlled by the sender mechanism selectively operate the automatic switches.

1,439,771. December 26, 1922; filed February 27, 1920. SIGNAL CONTROLLING SYSTEM; 16 claims; C. A. Sprague, East Orange, N. J.; assigned to Western Electric Co. In this radio system, in which an indicator is operated in accordance with fluctuations in applied energy, the indicator is aided to release when the applied energy in decreasing reaches a predetermined value.

1,439,772. December 26, 1922; filed October 21, 1919. SIGNALING APPARATUS AND CIRCUITS; 11 claims; J. F. Toomey, New York City, N. Y.; assigned to American Telephone & Telegraph Co. A source of tone current at an intermediate point on a line is automatically associated with the other part of line than that with which an operator is associated.

1,439,785. December 26, 1922; filed April 20, 1922. TELEPHONE RECEIVER OF THE WATCH CASE TYPE; four claims; F. W. Andrew, Brooklyn, N. Y.; assigned to Eisemann Magneto Corp., Brooklyn, N. Y. This receiver comprises a non-magnetic shell or casing provided with a cap and diaphragm. The pole pieces of a permanent magnet within the casing have base portions arranged between the magnet and back of the casing. A pair of insulated screws or bolts passes through the magnet and the base portions of the pole pieces for securing these parts to the back wall of the casing, and serve as binding posts for the coils on the magnet.

1,440,038. December 26, 1922; filed November 3, 1919. SPRING CLAMP FOR TELEPHONE INDEXES; two claims; D. Umanoff, New York City, N. Y. This clamp of resilient material comprises two arms and a normally expanded connecting coil which is extended through a small aperture in the upper part of an index plate, the arms being adapted to clasp a telephone mouthpiece.

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1,440,048. December 26, 1922; filed May 13, 1921. TELEPHONE INDEX MOUNTING; two claims; H. R. Alborne, Stillwater, Minn. A straight back support is clamped between the mouthpiece and transmitter face plate. A number of index leaves are turnably hung on their upper edges to the upper edge of the support, whereby the leaves may be swung from the front to the back of the support.

1,440,078. December 26, 1922; filed February 16, 1921. TELEPHONE LOCK; nine claims; W. F. Hemstreet, Brooklyn, N. Y. Adjustable means secure unitary dial-locking means to an automatic telephone instrument to permit adjustment with reference to the dial.

1,440,110. December 26, 1922; filed April 4, 1918. TRUNK CIRCUITS; 20 claims; C. Sparks, Oak Park, Ill.; assigned to Kellogg Switchboard & Supply Co. This trunk circuit is provided with terminals, one being normally disconnected from the other of the terminals. Means are responsive to a connection to one of the terminals for connecting the terminals together, and for preventing the connection together when the connection is made to one of the terminals.

1,440,111. December 26, 1922; filed May 23, 1918. TELEPHONE SYSTEM; 22 claims; C. Sparks, Oak Park, Ill.; assigned to Kellogg Switchboard & Supply Co. A receiver is connected in a balanced bridge circuit so that when the operator's telephone is connected for use, the current flow through the operator's receiver is reduced when the operator's transmitter is actuated. Provision is made for rendering ineffective the operator's receiver when the operator's telephone is not connected for use.

1,440,112. December 26, 1922; filed July 1, 1918; TELEPHONE SYSTEM; 28 claims; C. Sparks, Oak Park, Ill.; assigned to Kellogg Switchboard & Supply Co. Automatic means connecting the operator's telephone to, and disconnecting it from, the cord circuit. Means controlled jointly by the calling and called subscribers disassociate the cord circuit from one only of the subscriber's lines.

1,440,113. December 26, 1922; filed August 5, 1918. TELEPHONE SYSTEM; 37 claims; C. Sparks, Oak Park, Ill.; assigned to Kellogg Switchboard & Supply Co. A subscriber's telephone line provided with multiple terminals has multiple line signals which are operated responsive to an actuation of a substation switch, at the same time as a busy potential is placed upon the multiple terminals. A signal is associated with the cord circuit, and means are controlled by a subsequent unitary actuation of the substation switch for intermittently operating it.

1,440,114. December 26, 1922; filed August 5, 1918. TELEPHONE SYSTEM; 18 claims; C. Sparks, Oak Park, Ill.; assigned to Kellogg Switchboard & Supply Co. In this telephone system, which includes common battery and local battery telephone lines, a universal cord circuit interconnects the lines. A relay controlled over one of the local battery lines when the subscriber signals for disconnection, connects interrupter means in circuit with a signal in the cord circuit, thereby opening and closing the circuit of the signal causing it to flash. A relay causes the signal to glow continuously when a common battery line signals for disconnection.

15,512. (Reissue 1,381,343; June 14, 1921.); December 26, 1922; filed March 25, 1922. TELEPHONE ATTACHMENT; six claims; L. J. Sampson, Worcester, Mass. This telephone attachment consists of a tubular coin receptacle clamped to the standard of a desk telephone.

1,440,365. January 2, 1923; filed July 31, 1916. TELEPHONE SYSTEM; 31 claims; R. W. Augustine, Chicago; assigned to Kellogg Switchboard & Supply Co. In this signaling system a plurality of switches are controlled by a central office operator for connecting the code ringing apparatus to a party telephone line to automatically code ring the substations thereon. Substation controlled means operatively disconnect the code ringing apparatus from the telephone line.

1,440,407. January 2, 1923; filed July 2, 1920. DETECTING CIRCUITS; six claims; H. S. Osborne, New York City, N. Y.; assigned to American Telephone & Telegraph Co. This receiving circuit comprises a detector with a polar relay in its output circuit and controlled thereby and circuit connections between the detector and the polar relay including means for preventing the direct current component of a signaling pulse detected by the detector from affecting the polar relay.

1,440,752. January 2, 1923; filed September 9, 1919. TELEPHONE TEST SET; one claim; R. B. Stone, Nashville, Tenn. This casing for a portable telephone test set carrying a transmitter and receiver comprises a tube having one flat face. The tube is compressed together at one end and bent to carry the transmitter, and the receiver is mounted on the flat face at the other end, the tube serving as a container for electrical elements and apertured to receive leads.

1,441,270. January 9, 1923; filed September 26, 1919. TRANSMISSION SYSTEM; two claims; L. Espenschied, Hollis, N. Y.; assigned to American Telephone & Telegraph Co. A transmission line, upon which are superimposed alternating signaling currents and direct telegraph currents, is comprised of two line sections interconnected by a signaling circuit bridged across each of the line sections and including a translating device arranged to transmit only alternating signaling currents. A telegraph circuit interconnecting the line sections comprises a balanced four-wire circuit including relays each provided with two line windings. Windings of the relays are bridged across each of the line sections on each side of the bridged signaling circuit connection. Means are provided for preventing the signaling currents from being transmitted over the telegraph circuit.

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